DIFFERENTIAL EQUATIONS AND TRANSFORMS SYLLABUS

Module 1: Ordinary Differential Equations (ODE)

- Second-order non-homogeneous differential equations with constant coefficients
- Differential equations with variable coefficients
- Method of undetermined coefficients
- Method of variation of parameters
- Solving problems on damped forced oscillations and LCR circuit theory

Module 2: Partial Differential Equations (PDE)

- Formation of partial differential equations
- Singular integrals
- Solutions of standard types of first-order partial differential equations
- Lagrange's linear equation
- Method of separation of variables

Module 3: Laplace Transform

- Definition and properties of Laplace transform
- Laplace transform of standard functions
- Laplace transform of periodic functions
- Unit step function and impulse function
- Inverse Laplace transform using partial fractions method and convolution theorem

Module 4: Solution to ODE and PDE by Laplace Transform

- Solution of ODEs with non-homogeneous terms involving Heaviside function and impulse function
- Solving non-homogeneous systems using Laplace transform
- Solution of first-order PDEs using Laplace transform

Module 5: Fourier Series

- Fourier series and Euler's formulae
- Dirichlet's conditions
- Change of interval
- Half-range series
- RMS value and Parseval's identity

Module 6: Fourier Transform

- Complex Fourier transform and its properties
- Relation between Fourier and Laplace transforms
- Fourier sine and cosine transforms
- Parseval's identity
- Convolution theorem and applications to solve PDEs

Module 7: Z-Transform

- Definition of Z-transform and inverse Z-transform
- Standard functions
- Partial fractions and convolution method
- Difference equations
    - First and second-order difference equations with constant coefficients
    - Solution of simple difference equations using Z-transform