UNIT-I: Matrices & Complex Number

- **Matrices:**
  - Inverse of a matrix,
  - Properties of matrices,
  - Elementary Transformation,
  - Rank of Matrix,
  - Echelon or Normal Matrix,
  - Linear equations,
  - Linear dependence and linear independence of vectors,
  - Linear transformation,
  - Characteristics roots and characteristics vectors,
  - Properties of characteristic vectors,
  - Caley Hamilton Theorem,
  - Similarity of matrices,
  - Reduction of matrix to a diagonal matrix which has elements as characteristics values.

- **Complex Numbers:**
  - Complex number,
  - Equality of complex numbers,
  - Graphical representation of complex number **(Argand's Diagram),**
  - Polar form of complex numbers, P
  - polar form of x+iy for different signs of x, y,
  - Exponential form of complex numbers,
  - Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles,
  - Definition of hyperbolic function,
  - Relations between circular and hyperbolic functions,
  - Inverse hyperbolic functions,
  - Differentiation and Integration,
  - Graphs of the hyperbolic functions,
  - Logarithms of complex quality,
  - j(=i)as an operator(Electrical circuits)

UNIT-II

- **Equation of the first order and of the first degree:**
  - Separation of variables,
  - Equations homogeneous in x and y,
  - Non-homogeneous linear equations,
  - Exact differential Equation,
  - Integrating Factor,
  - Linear Equation and equation reducible to this form,
  - Method of substitution.
  - Differential equation of the first order of a degree higher than the first: Introduction,
  - Solvable for p (or the method of factors),
  - Solve for y, Solve for x, Clairaut's form of the equation,
  - Methods of Substitution,
  - Method of Substitution.
- **Linear Differential Equations with Constant Coefficients:**
  - Introduction,
  - The Differential Operator,
  - Linear Differential Equation f(D) y = 0,
  - Different cases depending on the nature of the root of the equation f(D) = 0,
  - Linear differential equation f(D) y = X,
  - The complimentary Function,
  - The inverse operator 1/f(D) and the symbolic expiration for the particular integral 1/f(D) X;
- **The general methods, Particular integral:** Short methods,
- **Particular integral:**
  - Other methods,
  - Differential equations reducible to the linear differential equations with constant coefficients.

UNIT-III

- **The Laplace Transform:**
  - Introduction,
  - Definition of the Laplace Transform,
  - Table of Elementary Laplace Transforms,
  - Theorems on Important Properties of Laplace Transformation,
  - First Shifting Theorem,
  - Second Shifting Theorem,
  - The Convolution Theorem,

- Laplace Transform of an Integral,
- Laplace Transform of Derivatives,

- **Inverse Laplace Transform:**
  - Shifting Theorem,
  - Partial fraction Methods,
  - Use of Convolution Theorem,
  - Solution of Ordinary Linear Differential Equations with Constant Coefficients,
  - Solution of Simultaneous Ordinary Differential Equations,
  - Laplace Transformation of Special Function,
  - Periodic Functions,
  - Heaviside Unit Step Function,
  - Dirac-delta Function (Unit Impulse Function),

UNIT-IV

- **Multiple Integrals:**
  - Double Integral,
  - Change of the order of the integration,
  - Double integral in polar co-ordinates,
- **Triple integrals.**
- **Applications of integration:**
  - Areas,
  - Volumes of solids.

UNIT-V

- **Beta and Gamma Functions** :
  - Definitions,
  - Properties and Problems.
- **Duplication formula**.
- **Differentiation Under the Integral Sign Error Functions**