

**Module-1**

**Vector Calculus**

**0 hours**

**Vector Differentiation:** Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields-Illustrative problems.

**Vector Integration:** Line integrals, Theorems of Green, Gauss and Stokes (without proof). Applications to work done by a force and flux. **(RBT Levels : LI & L2)**

## Module-2 Differential Equations of higher order 0 hours

Differential Equations of higher order:-  
Second order linear ODE's with constant coefficients-Inverse differential operators, method of variation of parameters; Cauchy's and Legendre homogeneous equations. Applications to oscillations of a spring and L-C-R circuits. **(RBT Levels : LI, L2 & L3)**

<b>Module-3</b>	<b>Partial Differential Equations(PDE's)</b>	<b>0 hours</b>
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**Partial Differential Equations(PDE's):-**

Formation of PDE's by elimination of arbitrary constants and functions.

Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one dimensional heat and wave equations and solutions by the method of separation of variables. **(RBT Levels: LI, L2 & L3)**

**Infinite Series:-**Series of positive terms-convergence and divergence. Cauchy's root test and D'Alembert's ratio test(without proof)-illustrative examples.

**Power Series solutions:-**Series solution of Bessel's differential equation leading to  $J_n(x)$ -Bessel's function of first kind-orthogonality. Series solution of Legendre's differential equation leading to  $P_n(x)$ -Legendre polynomials. Rodrigue's formula (without proof), problems. **(RBT Levels : L1 & L2)**



## Module-5 Numerical Methods 0 hours

**Numerical Methods:** Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). Solution of polynomial and transcendental equations-Newton-Raphson and Regula-Falsi methods( only formulae)-illustrative examples.

**Numerical integration:** Simpson's  $(1/3)^{th}$  and  $(3/8)^{th}$  rules, Weddle's rule (without proof)-Problems. **(RBT Levels: LI, LI & L3)**