**MA7702 Numerical Solutions of Ordinary and Partial Differential Equations**

**Ordinary Differential Equations:** Numerical solutions of IVP – Difference equations, stability, error and convergence analysis. Single step methods – Taylor series method, Euler method, Euler method, Picard’s method of successive approximation, Runge-Kutta method. Multi step methods – Predictor-Corrector method, Euler PC method, Milne and Adams Moulton Pc method. System of first order ODE, higher order IVPs. Numerical solutions of BVP – Linear BVP, finite difference methods, shooting methods, Newton’s method for system of equations, stability, error and convergence analysis, non-linear BVP, higher order BVP.

**Partial Differential Equations:** Classification of PDEs, Finite difference approximations to partial derivatives, convergence and stability analysis. Explicit and Implicit schemes – Crank –Nicolson scheme, tri-diagonal system, Laplace equation using standard five point formula and diagonal five point formula. ADI scheme, hyperbolic equation, explicit scheme, method of characteristics. Solution of one dimensional heat conduction equation by Schmidt and Crank Nicolson methods. Solution of wave equation.

**References:**

1. G. D. Smith, Numerical Solutions to Partial Differential Equations, Oxford University Press, 3rd Edn., 1986.
2. J. C. Strikwerda, Finite Difference Schemes and Partial Differential Equations, SIAM, 2004.
3. L. Lapidus and G. F. Pinder, Numerical Solution of Partial Differential Equations in Science and Engineering, John Wiley, 1982.