

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI-15

DEPARTMENT OF MATHEMATICS
Advanced Numerical Analysis for Differential Equations

Unit - I (Topology of Real numbers, Limit & Continuity of functions)

Intervals-Neighbourhood of a point -Open set--Closed set-Limit point of a set-Derived set-Closure of a set- Compact set--Limits --Limit of a function at a point—Continuity-Intermediate value theorem-Monotonic functions-Uniform continuity.

Unit II (Ordinary Differential Equations – Initial Value Problem first order)

Introduction -- IVP-Difference Equations-Single step methods-Stability Analysis of single step methods- convergence Analysis - Multistep methods-Stiff system- MATLAB Program.

Unit III (Ordinary Differential Equations -- Initial Value Problem second order and higher order)

Introduction -- IVP-Difference Equations-Single step methods -finite difference method for second order IVP and higher order IVP –Stability analysis and convergence analysis --solving system- MATLAB Program

Unit IV (Ordinary Differential Equations – Boundary Value Problem)

Introduction-Shooting method-Finite difference method for second order BVP-Nonlinear second order differential equation-Newton-Raphson method-Finite difference methods-Linear second order differential equations-Local truncation error-Derivative boundary conditions-Solution of tridiagonal system- MATLAB Program-error estimation.

Unit V (Partial Differential Equations)

Introduction- Difference methods for Parabolic PDEs - Difference methods for Hyperbolic PDEs - Difference methods for Elliptic PDEs - MATLAB Program.

References

1. M.K.Jain, Numerical solution of differential equations, New age international publishers, New Delhi, 2008.
2. N.P.Bali, Real Analysis, Golden Maths series, Firewall Media publishers, New Delhi, 2011.
3. M.D.Raisinghania, Ordinary and Partial Differential Equations, S.Chand & Company Ltd, New Delhi, 2010.
4. M.K.Jain, S.R.K.Iyengar, R.K.Jain, Numerical Methods for scientific and engineering computation, New age international publishers, New Delhi, 2010.