



Indian Institute of Technology

Course Details Report

Course No: MA6270

Course Name: Numerical Solutions of Partial Diff. Equations

Course Type:

Theory

Description:

This is a second level course intended to teach the students some advanced topics in the numerical solutions of partial differential equations.

Course Content:

Parabolic Equations: explicit and implicit finite difference approximations to one - dimensional heat equation, Alternating Direction Implicit (ADI) method, Hyperbolic Equation: Characteristic method, finite difference solution of second order wave equation, Elliptic equations: finite difference method in polar coordinates, techniques near curved boundaries, improvement of accuracy, methods to accelerate the convergence, Convergence, consistency and stability analysis, Finite element method: types of integral formulations, one and two dimensional elements, Galerkin formulation, application to Dirichlet and Neumann problems.

Text Books:

1. G D Smith, Numerical solution of partial differential equations: Finite difference methods, Oxford University press, 1977. 2. G. Evans, J. Blackledge, P. Yardley, Numerical Methods for Partial Differential Equations, 2nd edition, Springer, 2001.

Reference Books:

1 S. Larsson, V. Thomee, Partial Differential Equations with Numerical Methods, Springer, 2003.
2. K. Eriksson, D. Estep, P. Hansbo, C. Johnson, Computational Differential Equations, Cambridge Univ. Press, 1996.
3. H. P. Langtangen, Computational Partial Differential Equations, Numerical Methods and Diffpack Programming, 2nd edition, Springer, 2003.
4. D. Braess Finite Elements, 2nd edition, Cambridge Univ. Press, 2001.
5. C. Johnson, Numerical Solution of Partial Differential Equations by the Finite Element Method, Cambridge Univ. Press, 1987.