**سرفصل درس حل عددی معادلات دیفرانسیل با مشتقات جزئی**

## Reference:

## Numerical Solution of Partial Differential Equations: Finite Difference Methods

G. D. Smith

## Syllabus:

### 1. Introduction of PDEs

Classification of PDEs , Elliptic, Hyperbolic, Parabolic

### 2. Parabolic Equations: Finite Difference methods, Convergence and Stability

Explicit Forward Euler method, Implicit Backward Euler Method, Crank-Nicolson, A weighted avarege approximation, Derivative boundary conditions, The local truncation error, consistency, convergence, Stability,

### 3. Parabolic Equations

Reduction To a system of ordinary differential equations, Finite difference approximation via the ordinary differential equations, Reduction of the local truncation eeror, use of three time-level difference equations, Deferred correction method, Linearization by Newton's method, Richtmyer's linearization method, A three time-level method

### 4. Hyperbolic Equations

First-order quasi-linear equations and characteristics, a method for numerical integration along a characteristic, Lax-Wendroff explicit method, Wendroff's implicit approximation, Second-order quasi-linear hyperbolic equations, Rectangular nets and finite-difference methods for second-order hyperbolic equations

### 5. Elliptic Equations

Derivative boundary conditions in heat-conduction problem, Finite-differences in polar co-ordinates, Formulae for derivatives near a curved boundary,