**MA\*736 Advanced Numerical Analysis:**

**Iterative methods for linear systems:** Classical iterative methods (Jacobi, Gauss-Seidel and successive overrelaxation (SOR) methods), Krylov subspace methods; GMRES, Conjugate-gradient, biconjugate-gradient (BiCG), BiCGStab methods, preconditioning techniques, parallel implementations.

**Finite difference method:** Explicit and implicit schemes, consistence, stability and convergence, Lax equivalence theorem, numerical solutions to elliptic, parabolic and hyperbolic partial differential equations.

**Approximate method of solution :** Galerkin method, properties of Galerkin approximations, Petrov-Galerkin method, generalized Galerkin method.

**The finite element method(FEM) :** FEM for second order problems, one and two dimensional problems, finite elements(elements with a triangular mesh and a rectangular mesh and three dimensional finite elements), fourthorder problems, Hermite families of elements, isoparametric elements, numerical integration.

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2. L.N. Trefethen and David Bau, Numerical Linear Algebra, SIAM, 1997.
3. Joe D. Hoffman, Numerical methods for Engineers and Scientist, McGrow-Hill, 1993.
4. A. Quarteroni and A. Valli, Numerical Approximation of Partial Differential Equations, Springer, 1994.
5. K. Atkinson and W. Han, Theoretical Numerical Analysis : A Functional Analysis Frame-work, Springer-Verlag New York, 2001.
6. P.G. Ciarlet, The Finite Element Method for Elliptic Problems, North-Holland, Amsterdam, 1978.
7. S.C. Brenner and L.R. Scott, The Mathematical Theory of Finite Element Methods, Springer-Verlag, New York, 1994.
8. C. Johnson, Numerical Solution of Partial Differential Equations by the Finite Element Method, Cambridge University Press, 1987.