



Numerical Analysis (2)

Course Code	Course Num.	Course Name	Credit Hours	Lec	Lab	Tut	Prerequisites
MAT	433	Numerical Analysis (2)	4	3	1	1	MAT 333, MAT 434

Objectives:

- To study basic finite difference methods for partial differential equations.
 - To understand the concepts of consistency, stability, and convergence.
 - To learn to solve partial differential equations on the computer.
 - To introduce finite element method.
- The course will involve the use of Matlab or C++ in Lab.

Syllabus:

- **Advanced Numerical Linear Algebra:** Least Squares Method, Matrix Eigenvalue Problems, Power Method, QR Factorisation.
- **Finite difference techniques:** difference equation replacement; implicit and explicit finite difference method.
- **Boundary Value Problems for ODEs:** Multistep Methods, Finite Difference Methods for Systems of Differential Equations.
- **Finite Difference Method for PDEs:** Numerical Solution of Elliptic PDEs, Numerical Solution of Parabolic PDEs, Numerical Solution of Hyperbolic PDEs, Finite Difference Method for Boundary Value Problems.
- **Introduction to Finite Element Method:** application to heat and Laplace equations.

References:

- **Elementary Numerical Analysis**, 3rd Edition, Kendall Atkinson; Weimin Han; (2004).
- **Numerical Solution of Partial Differential Equations: An Introduction**, K. W. Morton & D. F. Mayers: Cambridge University Press.
- **An Introduction to Numerical methods and Analysis**, James F. Epperson, Wiley; (2002).
- **Numerical Analysis**, R. Burden and J. Faires, 8th ed., Brooks/Cole, 2001.

