Tribhuvan University
Institute of Science and Technology
Course of Study for Four Years Mathematics

Course Title: Numerical Methods   **Full Marks:** 50
Course No. : Math 303   **Pass Mark:** 35%
Level   **:** B.Sc.   **Year:** III
Nature of Course: Theory (Elective)
Period per week: 5 (3 Theory + 2 Practical)

Theory 35 + Practical 15 = 50 Marks

Course Contents:

Unit 1: Introduction to MatLab, Process of Numerical Computing, Characteristics of Numerical Computing, Introduction to Approximations,   Errors in Computation and Their Analysis, Significant Digits, Floating Point Representation, Accuracy and precision.   10 Lectures

Unit 2: Discrete Solution of Linear Equations: Basic Gauss Elimination Method, Gauss Elimination with pivoting, Triangular Factorization (Decomposition) Methods, Gauss Jordan Method, Matrix Inversion: Derivation of the Methods, Their Algorithms and Implementation. Jacobi and Gauss Seidel Iteration Methods: Derivation of the Methods, Algorithms, Rate of Convergence, Comparison between Them and Implementation.   15 Lectures

Unit 3: Interpolation and Curve Fitting: Interpolation by Lagrange, Interpolation by Newton, Divided Differences, Forward and Backward Difference Operators, Chebyshev Polynomial: Derivation, Algorithm and Implementation. Least Squares Method: Fitting a Straight Line, Derivation, Algorithm, and Implementation.   15 Lectures

Unit 4: Nonlinear Equations: Bisection method, False position method, Newton- Raphson method, Secant method, Fixed Point Iteration Method: Derivation, Algorithm, Comparison between Them, Rate of convergence, Error Computation and Implementation.   15 Lectures

Unit 5: Numerical Differentiation and Integrations, Some Solutions of ODEs: Difference approximation of first order derivative, Difference Approximation for Second Order Derivative, Newton Cotes Methods, Trapezoidal Rule, Simpson's 1/3 and 3/8 rule, Romberg integration Method, Solutions of ODEs with Picard , Taylor, Euler, Modified Euler, Runge - Kutta Method of order four: Derivation, Algorithm, Error Computation, Comparison to Each Other   and Implementation.   20 Lectures

References

1. Applied Numerical Analysis with Mat Lab. Author: Wan Young Yang, Wenwu Cao, Tae-Sang Chung and John Morris, John Wieley and Sons. INC., Publication.
2. Numerical Methods in Engineering with Mat Lab. Author: Jaan Kiusalaas , Cambridge University Press.
3. Numerical Methods. Author: E. Balaguruswamy, Mc Graw Hill.
4. Applied Numerical Analysis, Curtis F. Gerald, Patrick O. Wheately, Pearson.

5. Bansal, R.K, Goel, A.K and Sharma, M.K., MATLAB Its Applications on Engineering. Delhi, Pearson Education Inc.
6. Interactive MatLab Course (Hand Out).
7.