Module Code: MATH-418
Module Title: **Numerical Analysis - II**
Module Rating: 3 Cr. Hours
Pre-Requisite: Numerical Analysis - I

Numerical Differentiation

- Derivatives using: Lagrange's interpolation formula, Newton's divided difference formula, Gregory Newton forward/backward interpolation formula, Gauss's forward/backward interpolation formula, Stirling's formula, Laplace Everett's formula, Bessel's formula

Numerical Integration

- Newton-Cotes formulae
- Trapezoidal rule, Simpson rule, Weddle's rule, Boole's rule
- Errors in quadrature formulae
- Gaussian quadrature formulae

Formulation of Difference Equations

- Analogy of difference equations
- Linear homogeneous difference equations with constant coefficients
- Linear non-homogeneous difference equations with constant coefficients

Ordinary Differential Equations

- Introduction to ODEs
- Taylor's series method: Simultaneous first order differential equations, higher order differential equations
- Euler's, improved Euler's, modified Euler's and Runge-Kutta methods with error analysis
- Predictor-corrector methods for solving initial value problems

Recommended Books

1. Curtis F. Gerald and Patrick O. Wheatley, *Applied Numerical Analysis*, 6th edition, (Addison-Wesley Publishing Co. Pearson Education, 2003)
2. Richard L. Burden and J. Douglas Faires, *Numerical Analysis*, 6th edition, (Brooks/Cole Publishing Company,1997)
3. John H. Mathews, *Numerical Methods for Mathematics*, Science and Engineering, 3rd edition (Prentice Hall International, 2003)
4. V. N. Vedamurthy and N. Ch. S. N. Iyenger, *Numerical Methods*, (Vikas Publishing House Pvt. Ltd, 2002)
5. Steven C. Chapra and Raymond P. Canale, *Numerical Methods for Engineers* 3rd edition, (McGraw Hill International Edition, 1998)