# 17SH1104 - NUMERICAL ANALYSIS

(Common to all Branches)

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| **Course Category:** | Basic Sciences | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3-1-0 |
| **Prerequisite:** | Intermediate Mathematics | **Sessional Evaluation:****Univ. Exam Evaluation:****Total Marks:** | 4060100 |
| **Objectives** | To make the students learn about:* The Bisection, False Position, Iteration and Newton-Raphson Methods.
* The basic concepts of numerical solutions of simultaneous linear and non-linear algebraic equations.
* The concepts of Interpolation.
* The concepts of Numerical Differentiation and Integration.
* The numerical methods to solve Ordinary Differential Equations by using Taylor’s series method, Picard’s method, Euler’s and Modified Euler’s Methods and Runge-Kutta methods of 2nd and 4th order.
* The concepts of Curve Fitting and Regression Analysis.
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| **Course Outcomes** | After completing the course the student will be able to |
| CO1 | Acquire knowledge in solving algebraic and transcendental equations by using the appropriate numerical methods. |
| CO2 | Develop skills in analyzing the simultaneous linear and non-linear algebraic equations by various numerical methods. |
| CO3 | Attains skills in analyzing the methods of interpolating the given data. |
| CO4 | Acquire knowledge in Numerical Differentiation by Newton’s formula and in Numerical Integration by Trapezoidal, Simpson’s 1/3 and Simpson’s 3/8 rules. |
| CO5 | Apply appropriate numerical methods to solve Ordinary Differential Equations. |
| CO6 | Develop skills in designing mathematical models for fitting geometrical curves to the given data and also acquire knowledge in Regression Analysis. |
| **Course Content** | UNIT-I**Solution of Algebraic and Transcendental Equations:** Bisection, False position, Iteration, Newton, Raphson Methods.UNIT-II**Solution of Simultaneous Linear and Non-Linear Algebraic Equations:** Iteration method, Gauss Jordon method, Gauss Elimination with Pivotal condensation method, Triangular Factorization method, Gauss-Seidal method, Newton, Raphson method.UNIT-III**Interpolation:** Newton’s forward and backward interpolation formula, Lagrange’s interpolation, Gauss forward and backward formulae, Stirling’s formula.UNIT-IV**Numerical Differentiation and Integration:** First and Second Order Derivatives at given points by Newton’s formula. Trapezoidal rule, Simpson’s 1/3 rule and Simpson’s 3/8 rule.UNIT-V**Numerical Solution of Ordinary Differential Equations:** Solution by Taylor’s Series, Picard’s Method of Successive Approximations, Euler’s and Modified Euler’s Methods, Runge-Kutta Method of 2nd order and 4th order.UNIT-VI**Curve Fitting:** Introduction, Method of least squares, Linear and Non-linear equations. Correlation coefficient, Lines of regression, Rank correlation coefficient (Spearman’s Rank-Correlation). |
| **Text Books and References** | Text Books:1. Higher Engineering Mathematics-B.S.Grewal, Kanna Publishers, New Delhi.
2. Mathematical Methods - Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N. Prasad, S.Chand Publication, New Delhi.
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| Reference Books:1. Introductory Methods of Numerical Analysis - S.S. Sastry, Prentice Hall India Learning Private Limited, New Delhi.
2. Numerical Methods - E. Balagurusamy, Tata McGraw-Hill Education Pvt. Ltd, New Delhi.
3. Numerical Methods for Scientific and Engineering Computation- S.R.K. Iyengar, R.K. Jain, M.K.Jain, New Age International Publishers, New Delhi.
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