# **23BS21T2-COMPLEX VARIABLES AND NUMERICAL METHODS**

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| **Course Category:** | Basic Sciences | | **Credits:** | 3 |
| **Course Type:** | Theory | | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Pre-requisite:** | Intermediate Mathematics | | **Sessional Evaluation:**  **External Evaluation:**  **Total Marks:** | 30  70  100 |
|  | After completing the course, student will be able to | | | |
| **CO1** | Analyze limit, continuity and differentiation of functions of complex variables and Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions. | | |
| **CO2** | Understand Cauchy theorem, Cauchy integral formulas and apply these to evaluate complex contour integrals. Classify singularities and poles; find residues and evaluate complex integrals using the residue theorem. | | |
| **CO3** | Apply numerical methods to solve algebraic and transcendental equations | | |
| **CO4** | Derive interpolating polynomials using interpolation formulae | | |
| **CO5** | Solve differential and integral equations numerically | | |
| **Course Content:** | **UNIT- I**  **Complex Variable–Differentiation:**  Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy- Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.  **UNIT-II**  **Complex Variable–Integration:**  Line integral-Contour integration, Cauchy’s integral theorem(Simple Case), Cauchy Integral formula, Power series expansions: Taylor’s series, zeros of analytic functions, singularities, Laurent’s series, Residues, Cauchy Residue theorem (without proof),Evaluation of definite integral involving sine and cosine. **UNIT-III****Solution of Algebraic & Transcendental Equations** Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method System of Algebraic equations: Gauss Elimination, Jacoby and Gauss Siedal method. **UNIT-IV** **Interpolation** Finitedifferences-Newton’sforwardandbackwardinterpolationformulae–Lagrange’sformulae. Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares. **UNIT-V****Solution of Initial value problems to Ordinary differential equations** 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 methods (second and fourth order). | | | |
| **Text Books & Reference Books** | **TEXT BOOKS:**  1.B.S.Grewal, Higher Engineering Mathematics, KhannaPublishers,2017,44th Edition  2.S S Sastry, Introductory Methods of Numerical Analysis, PHI Learning  Private Limited. **REFERENCE BOOKS:**  1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10thEdition. 2. B.V.Ramana, Higher Engineering Mathematics, by Mc Graw Hill publishers   R.K.Jainand S.R.K.Iyengar, Advanced Engineering Mathematics, Alpha  Science International Ltd.,2021,5th Edition (9threprint). | | | |
| **e-resources** | :   1. https://onlinecourses.nptel.ac.in/noc17\_ma14/preview 2. https://onlinecourses.nptel.ac.in/noc20\_ma50/preview          3.   <http://nptel.ac.in/courses/111105090> | | | |