# **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:** | 3070100 |
|  | 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> |