I Year-I Semester		L	T	P	C
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MATHEMATICS-II (Numerical Methods and ComplexVariables) (R161110)

Prerequisite Course: Operation of Scientific Calculator

Course Description and Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes:

Upon completion of the course,the student will be able to achieve the following outcomes.

Cos	Course Outcomes	POs
1	Calculate a root of an algebraic and transcendental equations.	4
2	Establish the relation between the finite difference operators. Compute	5
3	Solve ordinary differential equations numerically using Euler's and RK method.	5
4	Apply Cauchy-Riemann equations to test the analyticity of two dimensional fluid	3
5	Evaluate complex integrals using Cauchy's integral formula.	3
6	Illustrate contour integrals and real integrals using residue theorem	5

Syllabus:

UNIT I:

Solution of Algebraic and Transcendental Equations:

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

UNIT II:

Interpolation:

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences – Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

UNIT III:

Numerical Integration and solution of Ordinary Differential equations:

Trapezoidal rule- Simpson's $1/3^{rd}$ and $3/8^{th}$ rule-Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

Unit-IV:

Functions of a complex variable

Complex function , Real and Imaginary parts of Complex function, Limit**,** Continuity and Derivative of complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function**,** $C-R$ equations in polar form, Harmonic functions, Milne-Thomson method, Simple applications to flow problems.

Unit-V:

Series Expansion and Complex Integration

Line integral of a complex function, Cauchy's theorem (only statement), Cauchy's Integral Formula Absolutely convergent and uniformly convergent of series of complex terms, Radius of convergence Taylor's series, Maclaurin's series expansion, Laurent's series.

Unit-VI:

Singularities and Residue Theorem

Zeros of an analytic function, Singularity, Isolated singularity, Removable singularity, Essential singularity, pole of order m, simple pole, Residues, Residue theorem, Calculation of residues, Residue at a pole of order m**,** Evaluation of real definite integrals: Integration around the unit circle**,** Integration around semi circle, Indenting the contours having poles on the real axis.

TEXT BOOKS:

1. B.S.GREWAL**,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

REFERENCE BOOKS:

1. DEAN G. DUFFY**,** Advanced engineering mathematics with MATLAB, CRC Press
2. V.RAVINDRANATH and P.VIJAYALAKSHMI**,** Mathematical Methods, Himalaya Publishing House.
3. ERWIN KREYSZIG**,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. DAVID KINCAID**, WARD CHENEY**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.