

MATHEMATICS IV

COMPLEX ANALYSIS & NUMERICAL ANALYSIS

Semester IV (ME, EE, CV, EC, AE Branches)

SUB CODE: CC401A

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
03	02	00	05	05	03	70	30	20	00	120

Outline of the Course:

Unit No	Topics
1	Complex numbers and Calculus of Complex functions
2	Complex Integration
3	Power Series
4	Conformal Mapping and its applications
5	Interpolation
6	Numerical Integration
7	Roots of equation
8	Numerical solution of Differential Equations
9	Linear algebraic equation

Total hours (Theory): 48

Total hours (Tutorial): 32

Total hours: 80

Detailed Syllabus

Unit	Topics	Lectures (Hours)	Weight age
	Complex Analysis		
1	Complex numbers and Calculus of Complex functions: Basic Concepts- Complex Numbers, Applications of De' Moivre's Theorem. Elementary Complex Mappings-Exponential, Trigonometric, Logarithmic function and Complex Exponent function, Hyperbolic functions, Inverse Hyperbolic functions and its properties. Limits of Functions, Continuity, Differentiability, Analytic functions, Cauchy-Riemann Equations, Necessary and Sufficient condition for analyticity, Properties of Analytic Functions, Laplace Equation, Harmonic Functions, Finding Harmonic Conjugate functions	8	20%
2	Complex Integration: Curves, Line Integrals (contour integral) and its properties. Line integrals of single valued functions, Line integrals of multiple valued functions (by choosing suitable branches). Cauchy-Goursat Theorem, Cauchy Integral Formula, Liouville Theorem, Fundamental Theorem of Algebra, Maximum Modulus Theorems.	6	15%
3	Power Series: Convergence (Ordinary, Uniform, Absolute) of power series, Taylor and Laurent Theorems, Laurent series expansions. Zeros of analytic functions. Singularities of analytic functions and their classification. Residues: Residue Theorem, Rouché's Theorem, Argument Principle.	7	10%
4	Conformal Mapping and its applications: Mappings by elementary functions, Mobius transformations, Schwarz-Christoffel transformation.	4	10%
	Numerical Analysis		
5	Interpolation: Interpolation by polynomials, forward difference formula, backward difference formula, central difference formula, Lagrange's Formula, divided differences, error of the interpolating polynomial.	7	15%
6	Numerical Integration: Newton-Cotes Formula, Trapezoidal Formula, Simpson's 1/3, 3/8 formula, Weddle's formula, Gaussian	5	10%

	Quadrature Formula.		
7	Roots of equation: Solution of a nonlinear equation: Bisection and Secant methods, Newton's method, rate of convergence, Power method for computation of Eigen values.	5	10%
8	Numerical solution of Differential Equations: Numerical solution of first order ordinary differential equations: Taylor, Euler and modified Euler method, Runge-Kutta methods.	3	5%
9	Linear algebraic equation: Gauss-Seidel methods, partial pivoting.	3	5%
	Total	48	100%

List of Tutorials

Sr. No.	Tutorial Content
1	Problem solving on “ Complex numbers and Calculus of Complex functions ”.
2	Problem solving on “ Complex Integration ”
3	Assignment on “ Power Series ”.
4	Assignment on “ Conformal Mapping and its applications ”.
5	Problem solving on “ Interpolation ”
6	Problem solving on “ Numerical Integration ”
7	Assignment on “ Roots of equation ”.
8	Assignment on “ Numerical solution of Differential Equations ”.
9	Assignment on “ Linear algebraic equation ”.

Instructional Method and Pedagogy (Continuous Internal Assessment (CIA) Scheme)

- Two Faculties will be covering the syllabus in each branch for 5 hours in a week. In Tutorial, class must be divided into two subclasses & faculties will be solving or assigning the problem of the subject in each subclass.

- Attendance is compulsory in lectures and Tutorial which carries 02 Marks.
- At regular intervals assignments is given to all students which carries 10 marks. Evaluation of these assignments will be observed under Daily Homework Daily Assessment (DHDA) System.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries 03 Marks.
- Viva Voce will be conducted at the end of the semester of 05 Marks.
- One internal exam of 30 marks is conducted as a part of internal theory evaluation.

Text Books:

1. “Advanced Engineering Mathematics (8th Edition)”, by E. Kreyszig, Wiley-India (2007).
2. “Complex variables and application” R. V. Churchill and J. W. Brown, (7th Edition), McGraw-Hill (2003).

Reference Books:

1. “Higher Engineering Mathematics” B V Ramana, Tata McGraw-Hill.
2. C. E. Froberg, Introduction to Numerical Analysis (2nd Edition), Addison-Wesley.