

2/4 B.Tech - THIRD SEMESTER

EC3T1

Engineering Mathematics – III

Credits: 3

Lecture: 3 periods/week

Tutorial: 1 period /week

Internal assessment: 30 marks

Semester end examination:70 marks

Course Objectives: Students learn to find approximate root of algebraic and transcendental equations and get familiarity with interpolation. They get good exposure to numerical differentiation and integration. They acquire knowledge in basic concepts like continuity, differentiation, integration and also series expansions, Cauchy's integral theorem, different types of singularities and evaluation of real integrals.

Learning Outcomes:

At the end of the course the student would be able to:

- (1) Determine approximate root of algebraic and transcendental equations.
- (2) Apply different interpolating methods to calculate value of interpolating polynomial at given point.
- (3) Evaluate integrals making use of quadrature formulae, obtain derivative at given point of the interpolating polynomial.
- (4) Solve ordinary differential equations with given initial condition by Taylor's, picard's, Euler's methods
- (5) Determine complex potential function and summarize the properties of elementary functions of complex variables.
- (6) Evaluate integrals making use of Cauchy's integral formula. Write series expansions of complex functions.
- (7) Solve improper integral making use of residues.
- (8) Determine the image of given regions under given conformal mappings.

UNIT- I

Solution of Algebraic and Transcendental Equations: Introduction – Bisection method – Method of false position – Iteration method – Newton-Raphson's method

UNIT-II

Interpolation: Introduction- Errors in polynomial interpolation – finite differences- forward differences- backward differences – central differences – Symbolic relations -Differences of a polynomial - Newton's formulae for interpolation – Interpolation with unevenly spaced points - Lagrange's Interpolation formula.

UNIT – III

Numerical Differentiation and Integration: Differentiation using finite differences - Trapezoidal rule – Simpson's 1/3 rule –Simpson's 3/8 rule.

UNIT – IV

Numerical solution of Ordinary Differential equations: Solution by Taylor's series method - Picard's Method of successive approximations - Euler's Method - Runge-Kutta Methods – Predictor - Corrector Methods - Milne Thompsons's method.

UNIT - V

Functions of a complex variable: Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions –Milne Thompson method. Introduction to elementary functions.

UNIT - VI

Complex Integration: Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

Complex power series: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series.

UNIT-VII

Singular points – Isolated singular point – pole of order n – essential singularity.

Residue – Evaluation of residues - Residue theorem - Evaluation of integrals of the

type $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta, \int_{-\infty}^{\infty} f(x)dx$.

UNIT-VIII

Conformal mapping: Standard transformations - Translation, rotation, inversion -

Transformation by e^z , $\ln z$, z^2 , z^n (n is a positive integer), $\sin z$, $\cos z$, $z + \frac{a}{z}$ and bilinear transformation - fixed point - cross ratio - properties - determination of bilinear transformation mapping 3 given points.

Learning Resources

Text Books:

1. A Textbook on Mathematical Methods - Himalaya Publishing House- V. Ravindranath, P. Vijayalaxmi- 1st Revised Edition: 2011.
2. Higher Engineering Mathematics – Khanna Publishers – B.S. Grewal – 42nd Edition: 2012, June.
3. Engineering Mathematics (Volume – III) - S.Chand - T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham, M.V.S.S.N. Prasad- 9th Revised Edition: 2012.

References:

1. Advanced Engineering Mathematics – Wiley – Erwin Kreyszig- 8th Edition:2006
2. A Text Book of Engineering Mathematics – Tata McGraw Hill - B. V. Ramana- 3rd Edition: 2008
3. Text Book of Engineering Mathematics-Special Functions and Complex Variables– PHI – Shahanaz Bathul: 2008