

NUMERICAL METHODS & COMPLEX VARIABLES

Course Code	20BS1302	Year	II	Semester	I
Course Category	Basic Sciences course	Branch	ECE, EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes

After successful completion of the course, the student will be able to

CO1	Understand the basic concepts of Numerical Methods and complex variables.(L2)
CO2	Apply different Numerical methods to solve the problems of numerical differentiation, integration, ordinary differential equations.(L3)
CO3	Construct an analytic function and complex power series. (L3)
CO4	Estimate the interpolated values, approximate roots, areas and derivatives. (L4)
CO5	Analyse the region to evaluate integrals. (L4)
CO6	Apply the concepts of Numerical methods and Complex variables to solve the problems and submit a report. (L3)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations
(3-High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3								2	2				
CO3	3								2	2				
CO4		3												
CO5		3												
CO6	3								2	2				

UNIT No.	Contents	Mapped COs
I	<p>Solution to Algebraic and Transcendental Equations</p> <p>Solution of algebraic and transcendental equations: Bisection method, method of false position and Newton-Raphson's method.</p> <p>Finite differences, relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal</p>	CO1,CO2, CO4,CO6

	intervals: Lagrange's formula. (All theorems/properties without proofs)	
II	<p>Numerical Differentiation and Integration</p> <p>Numerical Differentiation- Newton's forward and backward difference formulae. Numerical integration- trapezoidal rule, Simpson's $\frac{1^{rd}}{3}$ and $\frac{3^{th}}{8}$ rules. Ordinary differential equations: Euler's, modified Euler's, Runge-Kutta method of fourth order for solving first order equations. (All theorems/properties without proofs)</p>	CO1,CO2, CO4,CO6
III	<p>Functions of a complex variable:</p> <p>Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions –Milne-Thompson's method.</p> <p>(All theorems/properties without proofs)</p>	CO1,CO3, CO5,CO6
IV	<p>Complex Integration:</p> <p>Line integral – Evaluation along a path– 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.</p> <p>(All theorems/properties without proofs)</p>	CO1,CO3, CO5,CO6
V	<p>Singular points – Isolated singular point – pole of order n – essential singularity.</p> <p>Residue – Evaluation of residues - Residue theorem - Evaluation of integrals of the form $\int_0^{2\pi} f(\cos \theta, \sin \theta)d\theta$ and $\int_{-\infty}^{\infty} f(x)dx$ (All theorems/properties without proofs)</p>	CO1,CO3, CO5,CO6

Learning Resource(s)

Text Book(s)

1. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 44/e, 2019.
2. 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.

Reference Book(s)

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9/e, John Wiley & Sons, 2006.

e- Resources & other digital material

1. <https://www.nptel.ac.in/courses/111/107/111107105/>
2. <https://www.nptel.ac.in/courses/111/105/111105134/>
3. <https://nptel.ac.in/courses/111/106/111106141/>