

COMPLEX ANALYSIS AND SPECIAL FUNCTIONS

III Semester: ECE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB05	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45		Tutorial Classes: 15		Practical Classes: Nil			Total Classes: 60	
<p>COURSE OBJECTIVES: The students will try to learn:</p> <p>I The applications of complex variable and conformal mapping in two dimensional complex potential theories.</p> <p>II The fundamental calculus theorems and criteria for the independent path on contour integral used in problems of engineering.</p> <p>III The concepts of special functions and its application for solving the partial differential equations in physics and engineering.</p> <p>IV The mathematics of combinatorial enumeration by using generating functions and complex analysis for understanding the numerical growth rates.</p>								
<p>COURSE OUTCOMES (COs):</p> <p>CO 1 Identify the fundamental concepts of analyticity and differentiability for calculus of complex functions and their role in applied context.</p> <p>CO 2 Utilize the concepts of analyticity for finding complex conjugates and their role in applied contexts.</p> <p>CO 3 Make use of the conformal mapping technique for transferring geometric structure of complex functions with much more convenient geometry.</p> <p>CO 4 Apply integral theorems of complex analysis and its consequences for the analytic function with derivatives of all orders in simple connected region.</p> <p>CO 5 Extend the Taylor and Laurent series for expressing the function in terms of complex power series.</p> <p>CO 6 Classify Singularities and Poles of Complex functions for evaluating definite and indefinite Complex integrals.</p> <p>CO 7 Apply Residue theorem for computing definite integrals of real and complex analytic functions over closed curves.</p> <p>CO 8 Relate the concept of improper integral and second order differential equations of special functions for formulating real world problems with futuristic approach.</p> <p>CO 9 Determine the characteristics of special functions generalization on elementary factorial function for the proper and improper integrals.</p> <p>CO 10 Choose an appropriate special function on physical phenomena arising in engineering problems and quantum physics.</p> <p>CO 11 Analyze the role of Bessel functions in the process of obtaining the series solutions for second order differential equation.</p>								

MODULE-I	COMPLEX FUNCTIONS AND DIFFERENTIATION	Classes: 08
Complex functions differentiation and integration: Complex functions and its representation on argand plane, concepts of limit, continuity, differentiability, analyticity, Cauchy-Riemann conditions and harmonic functions; Milne-Thomson method. Bilinear Transformation.		
MODULE-II	COMPLEX INTEGRATION	Classes: 10
Line integral: Evaluation along a path and by indefinite integration; Cauchy's integral theorem; Cauchy's integral formula; Generalized integral formula; Power series expansions of complex functions and contour Integration: Radius of convergence.		
MODULE -III	POWER SERIES EXPANSION OF COMPLEX FUNCTION	Classes: 10
Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point; Isolated singular point; Pole of order m; Essential singularity; Residue: Cauchy Residue Theorem. Evaluation of Residue by Laurent Series and Residue Theorem. Evaluation of integrals of the type $\int_0^{2\pi} f \cos x, \sin x dx$ and $\int_0^a f x dx$		
MODULE -IV	SPECIAL FUNCTIONS-I	Classes: 08
Improper integrals; Beta and Gamma functions: Definitions; Properties of Beta and Gamma function; Standard forms of Beta functions; Relationship between Beta and Gamma functions.		
MODULE -V	SPECIAL FUNCTIONS-II	Classes: 09
Bessel's Differential equation: Bessel function, properties of Bessel function, Recurrence relations of Bessel function, Generating function and Orthogonality of Bessel function, Trigonometric expansions involving Bessel function.		
Text Books:		
1. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 10 th Edition, 2010 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43 rd Edition, 2015.		
Reference Books:		
1. T.K.V Iyengar, B.Krishna Gandhi, "Engineering Mathematics - III", S.Chand & Co., 12 th Edition, 2015. 2. RK Jain & SRK Iyengar, "Advanced Engineering Mathematics", Narosa Publishers, 5 th Edition, 2016.		
Web References:		
1. http://www.efunda.com/math/math_home/math.cfm 2. http://www.ocw.mit.edu/resources/#Mathematics 3. http://www.sosmath.com 4. http://www.mathworld.wolfram.com		
E-Text Books:		
1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html 2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks		