COMPLEX ANALYSIS AND PROBABILITY DISTRIBUTIONS

IV Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHSB06	Foundation	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

COURSE OBJECTIVES :

The course should enable the students to:

I. Understand the basic theory of complex functions to express the power series.
II. Evaluate the contour integration using Cauchy residue theorem.
III. Enrich the knowledge of probability on single random variables and probability distributions.

COURSE OUTCOMES (COs) :

CO 1: Asses the continuity/differentiability/analyticity of a Complex function using Cauchy-Riemann equations, find complex conjugate using Milne Thomson method
CO 2: Recognize and apply the Cauchy's integral formula and the generalized Cauchy's integral formula. Evaluate complex functions as power series and radius of convergence of power series.
CO 3: Establish a contour integral with an integrand which has singularities lying inside or outside the simple closed contour. Expand complex function as power series using Taylor's ,Laurent series and understand the concept of bilinear transformation.
CO 4: Enrich the knowledge of Probability to discrete and continuous random variables.
CO 5: Analyze probability distributions for Binomial, Poisson and normal distributions and study its properties.

COURSE LEARNING OUTCOMES (CLOs):

1. Recall continuity, differentiability, analyticity of a function using limits.
2. Interpret the conditions for a complex variable to be analytic and/or entire function.
3. Interpret the concepts of Cauchy-Riemann relations and harmonic functions.
4. Analyze the Bilinear transformation by cross ratio property.
5. Identify the conditions of fixed and critical point of Bilinear Transformation.
6. Demonstrate the area under a curve using the concepts of indefinite integration.
7. Interpret the concepts of the Cauchy's integral formula and the generalized Cauchy's integral formula.
8. Demonstrate complex functions as power series and radius of convergence of power series.
9. Interpret the concept of complex integration to the real-world problems of flow with circulation around a cylinder.
10. Asses the Taylor's and Laurent series expansion of complex functions.
11. Interpret the concept of different types of singularities for analytic function..
12. Identify the poles, residues and solve integrals using Cauchy's residue theorem.
13. Interpret the concept of Cauchy's residue theorem to the real-world problems of Quantum Mechanical scattering and Quantum theory of atomic collisions.
14. Demonstrate an understanding of the basic concepts of probability and random variables.
15. Classify the types of random variables and calculate mean, variance.

16. Estimate moment about origin, central moments, moment generating function of probability distribution.
17. Recognize where the Binomial distribution could be appropriate model of the distributions.
18. Recognize where the Poisson distribution could be appropriate model of the distributions.
19. Recognize where the Binomial distribution and Poisson distribution could be appropriate to find mean, variance of the distributions.
20. Apply the inferential methods relating to the means of normal distributions.
21. Interpret Binomial distribution to the phenomena of real-world problem like sick versus healthy.
22. Identify the mapping of Normal distribution in real-world problem to analyze the stock market.
23. Use Poisson distribution in real-world problem to predict soccer scores.
24. Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.

Module-I	**COMPLEX FUNCTIONS AND DIFFERENTIATION**	**Classes: 09**

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: 09**

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: 09**

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

Module -IV	**SINGLE RANDOM VARIABLES**	**Classes: 09**

Random variables: Discrete and continuous, probability distributions, mass function-density function of a probability distribution. Mathematical expectation. Moment about origin, central moments, moment generating function of probability distribution.

Module -V	**PROBABILITY DISTRIBUTIONS**	**Classes: 09**

Binomial, Poisson and normal distributions and their properties.

Text Books:

1. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 10th Edition, 2010
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2015.

Reference Books:

1. T.K.V Iyengar, B.Krishna Gandhi, "Engineering Mathematics - III", S. Chand & Co., 12th Edition, 2015.
2. T.K.V Iyengar, B.Krishna Gandhi, "Probability and Statistics", S. Chand & Co., 7th Edition, 2015.
3. Churchill, R.V. and Brown, J.W, "Complex Variables and Applications", Tata McGraw-Hill, 8th Edition, 2012.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resourcs/#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