18UMAC400	Engineering Mathematics-IV	(3 - 0 - 0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

To provide an insight into applications of conformal mapping, integration of complex functions and application of probability distributions in Engineering.

Course Outcomes (COs):

Description of the Course Outcomes: At the end of the course the student will be able to:		**Mapping to POs(1-12)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Construct and use the concepts of analytic function to solve the problems arising in Engineering field.			1
CO-2	Utilize conformal transformation and complex integral to transform irregular domain onto a relatively simple domain.		1	
CO-3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.		1	
CO-4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.		1,2	
CO-5	Estimate the correlation, covariance using joint probability distributions. Also use student's t-distribution, Chi-square distribution as a test of goodness of it.		1,2	

POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Mapping Level	1.8	2	-	-	-	-	-	-		-	-	-

Pre-requisites: 1. A basic course on Differentiation and integration of function.
2. A basic course on probability and statistical averages.

Contents:

Unit-I

Calculus of complex functions: Review of function of a complex variable, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms. Construction of analytic functions: Milne-Thomson method-Problems. **7 Hrs.**

Unit-II

Conformal transformations: Introduction. Discussion of transformations $\mathrm{w} = \mathrm{e}^{\mathrm{z}}; \mathrm{w} = \mathrm{z}^2, \mathrm{w} = \mathrm{z} + \frac{1}{\mathrm{z}}, \mathrm{z} \neq \mathrm{o})$. Bilinear transformations- Problems.
Complex integration: Line integral of a complex function, Cauchy's theorem and Cauchy's Integral theorem. **8 Hrs.**

Unit-III

Probability Distributions: Review of basic probability theory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions-problems (No derivation for mean and standard deviation)-Illustrative examples. **8 Hrs.**

Unit-IV

Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression–problems.
Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form $= ax + b; y = ax^2 + bx + c; y = ax^b$ **.** **8 Hrs.**

Unit-V

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation and covariance.

Sampling Theory: Introduction to sampling distributions, standard error, Type-I and Type-IIerrors.Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness offit. **8 Hrs.**

Reference Books:

1. E. Kreyszig:Advanced Engineering Mathematics, John Wiley & Sons 10th edition. (Reprint) 2016.
2. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.
3. Srimanta Pal et al: Engineering Mathematics, Oxford University Press, 3rd edition, 2016.