## **COMPLEX VARIABLES & STATISTICAL METHODS**

# **Learning Objectives:**

At the end of semester, the students able to understand the concepts of:

- ➤ To familiarize the Complex Variables
- > Series expansions and Residue theorems.
- > Discrete and Continuous random variables
- > To familiarize the students with the foundations of probability and statistical Methods
- > To equip the students to solve application problems in their disciplines.

#### **Course Outcomes:**

- 1. Apply Cauchy Riemann equations to Complex valued functions to determine whether a given continuous function is analytic.
- 2. Find the differentiation and Integration of Complex valued functions used in engineering problems and make use of the Cauchy residue theorem to evaluate certain integrals.
- 3. Apply Discrete and Continuous probability distributions.
- 4. Design the components of a classical hypothesis test
- 5. Infer the Statistical inferential methods based on small and large sampling tests.

## **CO – PO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	-	1	-	-	-	-	-	_	_	1
2	3	2	-	1	-	-	-	-	-	_	-	1
3	2	2	-	2	-	-	-	-	-	-	-	1
4	2	2	2	-	-	-	-	-	-	-	-	1
5	1	2	ı	2	ı	1	-	-	2	-	-	1

## **CO-PSO Mapping**

CO	PSO1	PSO2	PSO3
1	-	-	2
2	-	-	2
3	-	-	2
4	-	-	2
5	-	-	2

# **UNIT – I:** Functions of a complex variable and Complex integration:

Introduction – Continuity – Differentiability – Analyticity – Properties – Cauchy Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method. Complex integration: Line integral - Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs).

## **UNIT – II:** Series expansions and Residue Theorem:

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Types of Singularities: Isolated – pole of order m – Essential – Residues –Residue theorem Improper real integrals  $\int_{-\infty}^{\infty} f(x)dx$ ;  $\int_{C}^{C+2\pi} f(\cos\theta, \sin\theta)d\theta$ ;

## **UNIT – III:** Probability and Distributions:

Review of probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

## **UNIT – IV:** Sampling Theory:

Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction  $\chi^2$  and F-distributions – Point and Interval estimations – Standard error and Maximum error of estimate.

## **UNIT – V:** Tests of Hypothesis:

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance- Confidence limits-Test of significance for large samples-single and two means – single and two proportions- Student's t- distribution- significance test of a sample mean – significance test of difference between sample means. F-test, chi-square test ( $\chi^2$ ) and test of goodness of fit.

#### **Text Books:**

- 1. Advanced Engineering Mathematics: BS Grewal, Khanna Publishers(42nd Ed).
- 2. Probability and Statistics for Engineers: Miller and John E. Freund, PrenticeHall of India.

#### **Reference Books:**

- 1. Probability And Statistics: Dr.T.K.V.Iyengar, Dr.B. K. Krishna Gandhi, S.Ranganatham, Dr. M.V.S.S.N. Prasad, S.Chand Publications.
- 2. Probability, Statistics and Random Processes, Murugesan, AnuradhaPublishers, Chennai.
- 3. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley India Edition.
- 4. Advanced Engineering Mathematics: Michael Greenberg, Pearson.
- 5. Probability and Statistics for Engineers and Scientists: Ronald E. Walpole, Sharon L. Mayers and Keying Ye: Pearson.

## Web Links:

- 1. https://nptel.ac.in/courses/111/103/111103070/
- 2. https://onlinecourses.nptel.ac.in/noc17 ma17/preview
- 3. https://onlinecourses.nptel.ac.in/noc16 ma03/preview