COMPLEX VARIABLES, PROBABILITY & SAMPLING

[ENGINEERING MATHEMATICS – IV]

[Common to MECHANICAL and CHEMICAL]

[R – 20 Regulation]

	Credits:3
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre- requisites: Complex Numbers, Differentiation, Integration, Binomial expansions and partial fractions.

Course Outcomes: At the end of the course, the student will be able to do

CO1: Analyze limit, continuity and differentiation of functions of complex variables and understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.

CO2 : Understand Cauchy's theorem and Cauchy's integral formulas and apply these to evaluate complex contour integrals and represent functions as Taylor and Laurent series and determine their intervals of convergence.

CO3: Be familiar with numerical solution of ordinary differential equations.

CO4: Examine, analyze and compare Probability distributions**.**

CO5: Analyze the Statistical data by using statistical tests and to draw valid inferences about the population parameters.

CO – PO Mapping :

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2										1
CO-2	3	2										1
CO-3	3	2										1
CO-4	3	2										1
CO-5	3	2										1

SYLLABUS

UNIT-I: FUNCTIONS OF A COMPLEX VARIABLE: [12 Lectures]

Complex function – Real and imaginary parts of complex function – Limit – Continuity and derivative of a complex function – Cauchy-Riemann equations – Analytic function – Entire function – Singular point – Conjugate function – Cauchy-Riemann equations in polar form – Harmonic functions – Milne-Thomson method – Simple applications to flow problems – Applications to flow problems – Some standard transformations(Translation, Inversion and Reflection , Bilinear transformations and its fixed points).

Sections: 20.1, 20.2, 20.3, 20.4, 20.5, 20.6 and 20.8.

UNIT – II: COMPLEX INTEGRATION & SERIES OF COMPLEX TERMS [12 Lectures]

Complex integration – Cauchy's theorem – Cauchy's integral formula – Series of complex terms: Taylor's series, MaClaurin's series expansion, and Laurent's series (without proofs).

Sections: 20.12, 20.13, 20.14 and 20.16.

UNIT – III: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS [12 Lectures]

Picard's method – Taylor's series method – Euler's method – Runge-Kutta Method – Predictor - Corrector methods – Milne's method.

Sections: 32.1, 32.2, 32.3, 32.4, 32.7, 32.8 and 32.9

UNIT - IV: PROBABILITY AND DISTRIBUTIONS [12 Lectures]

Introduction – Basic terminology – Probability and set notations – Addition law of probability – Independent events – Baye's theorem – Random variable – Discrete probability distribution:

Binomial distribution – Continuous probability distributions: Poisson distribution and normal distribution (mean , variance , standard deviation and their properties without proofs).

Sections: 26.1, 26.2, 26.3, 26.4, 26.5, 26.6, 26.7, 26.8, 26.9, 26.14, 26.15 and 26.16.

UNIT-V: SAMPLING THEORY **[12 Lectures]**

Introduction – Sampling distribution – Testing a hypothesis – Level of significance – Confidence limits – Test of Significance of large samples (Test of significance of single mean, difference of means) – Confidence limits for unknown mean – Small samples – Students t-distribution – Significance test of a sample mean – Significance test of difference between sample means – chi square test – Goodness of fit.

Sections: 27.1, 27.2, 27.3, 27.4, 27.5, 27.11, 27.12, 27.13, 27.14, 27.15, 26.16, 27.17 and 27.18.

TEXTBOOK:

B. S. Grewal, *Higher Engineering Mathematics*, 43rd edition, Khanna publishers, 2017.

REFERENCE BOOKS:

1. **N P. Bali and Manish Goyal**, *A text book of Engineering Mathematics* , Laxmi publications, latest edition.
2. **Erwin Kreyszig**, *Advanced Engineering Mathematics*, 10th edition, John Wiley & Sons, 2011.
3. **R. K. Jain and S. R. K. Iyengar**, *Advanced Engineering Mathematics*, 3rd edition , Alpha Science International Ltd., 2002.
4. **George B. Thomas, Maurice D. Weir and Joel Hass, Thomas**, *Calculus*, 13th edition , Pearson Publishers.