Second Year- Second Semester

Course code	CSE/BS/B/Math/T/221
Category	Basic Science
Course title	**Mathematics IV**
Scheme and Credits	L–T–P: 4-0-0; Credits: 4.0; Semester – I I
Pre-requisites (if any)	

Syllabus:

Discrete Structure:

Set Theory: Review of set theory basics, Partially ordered sets, Lattice, Relations, Equivalence relations and induced partitions, Countable and uncountable sets and their properties. Reordered sets. Least upper bound property. Statement of real number system as an ordered field with least upper bound property. Rational

numbers. Algebraic and transcendental numbers. Infinite decimal expansion of real numbers. Cantor's diagonalisation method for uncountability of real numbers. 10 L

Introduction to Mathematical Logic: Propositions and compound propositions, Basic logical operations, Truth tables, Tautologies and contradictions, logical equivalence, logical implication, inference, quantifiers 6 L

Functions; mappings; injection and surjections; composition of functions; inverse functions; special functions; recursive function theory; 4 L

Proof strategies and Mathematical Induction 2 L

Pigeonhole principle , Permutation and combinations 4 L

Probability Theory and Statistics:
Mathematical Theory of Probability: Basic concepts, Classical and axiomatic approaches, Sample space and events, Properties of probability functions. 4 L

Conditional probability and independent events, Concept of random variable, Discrete and continuous probability density, mass and distribution functions 4L

Expectations and moments, Moment generating and characteristic functions, Uniform, binomial, poisson, exponential and normal distributions, Multi – dimensional random variables and random vectors, Joint, marginal and conditional probability distributions 10L

Functions of random variable and random vector, Linear transformation of random variable and random vector, Independent random variables, Mean square estimation, Correlation and regression, Central limit theorem. 6 L

Introduction to stochastic processes: Markov, stationary and ergodic processes, Correlation function and power spectral density. Introduction to Queuing Theory: Kendall's Notations, M/M/1, M/M/m Queue, effect of bulk arrival 8L

Books:

1. C. L. Liu, Elements of Discrete Mathematics
2. J.L. Matt, A. Kandal and T. P. Taluk Dar: Dicrete Mathematics for Computer Scientists and Mathematicians
3. S.K. Mapa, Higher Algebra, Abstract and Linear
4. Amritava Gupta, Groundwork of Mathematical Probability and Statistics
5. A. M. Goon, M.K. Gupta and B. Dasgupta, Basic Statistics
6. J. Medhi, Stochastic Process
7. R. A, Fisher, An Introduction to Probability theory and its applications, Vol-1

Course Outcomes (CO):

Students will

1. be able to learn the basic mathematical objects such as sets, relations, and mappings and their simple properties.
2. learn basic concepts of real number system including least upper bound property, different representation of real number, and Canforce method for uncountability of real number.
3. be familiar with mathematical logic in the capacity of propositional logic and predicate logic. Gain knowledge in using mathematical induction in basic combinatorics to apply in counting finite elements.

4. understand key concepts of probability including discrete and random variables, probability distribution. will learn general properties of joint marginal and conditional distribution, expectations, moments and variant which help to analyze these distributions.
5. be able to define and explain different popular distribution (normal, binomial, poisson). Be able to understand functions of random variables and random vectors with their linear transformation, correlation, regression, central limit theorem which are relevant to data analysis.
6. be familiar with markov process, correlation functions and power spectral density and understand basic concepts of queuing theory and some important queuing models.

Mathematics IV	Program Outcomes												Program Specific Outcomes			
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
CO 1	2	1											2		1	
CO 2	2	1											2		1	
CO 3	2	1		2									2		1	
CO 4	1			2									1		2	
CO 5	1			2									1		2	
CO 6	1			2									1		2	