PROBABILITY, STATISTICS AND QUEUING THEORY

II/IV B.Tech. II - Semester
[R-19 Regulation]
Common for CSE & IT

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

Prerequisites: Elementary knowledge of Set theory, Combinations, Calculus and basic Statistics.

Course Objective : The objective of this course is to provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.

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

CO - 1	Demonstrate basic principles of probability and understand a random variable that describe randomness or an uncertainty in certain realistic situation. It can be of either discrete or continuous type.
CO - 2	Comprehend concepts of discrete, continuous probability distributions and able to solve problems of probability using Binomial, Poisson, Uniform Distribution, Exponential Distribution, Normal distributions.
CO - 3	Compute simple correlation between the variables and fit straight line, parabola by the principle of least squares.
CO - 4	Analyze the statistical data and apply various small or large sample tests for testing the hypothesis.
CO - 5	Understand about different Queuing models and its applications.

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 : PROBABILITY & MATHEMATICAL EXPECTATIONS [12 Periods]

Introduction to Probability : Definition of Random Experiment – Events and sample space – Definition of probability – Addition and multiplication theorems – Conditional probability – Baye's theorem – Simple problems on Baye's theorem.

Introduction to Random variable: Discrete and continuous random variables – Distribution function of random variable – Properties – Probability mass function – Probability density function – Mathematical expectation – Properties of mathematical expectation – Moments, moment generating function – Mean and variance.

Learning outcome: At the end of this unit, student will be able to

- Calculate probabilities using conditional probability, Rule of total probability and Bayes' theorem (L_3)
- Explain the concept of a random variable and the probability distributions(L_5)
- Express the features of discrete and continuous random variables and explain about probability mass, density function and formulate the distribution functions. (L_5)
- Calculate the expected value of a random variable and moments and formulates the Moment Generating Function(L_3)

UNIT – II : PROBABILITY DISTRIBUTIONS [14 Periods]

Discrete distributions: Binomial distribution – Poisson distribution – Mean, Variance, Moment generating function and problems.

Continuous probability distributions: Uniform distribution – Exponential distribution – Memoryless property – Normal distribution – Properties of normal distribution – Importance of normal distribution – Area properties of normal curve - MGF, Mean ,Variance and simple problems.

Learning outcome: At the end of this unit, student will be able to

- Understand importance of discrete probability distributions Binomial, Poisson and solve the problems about these distributions (L_2)
- Understand importance of continuous distributions Exponential ,Uniform and Normal and Exponential Distribution and solve the problems about these distributions(L_2)
- calculate probabilities of events for these distributions using the probability function, probability density function or cumulative distribution function (L_3)

UNIT – III: CURVE FITTING, CORRELATION AND REGRESSION [10 Periods]

Curve Fitting : Principle of least squares – Method of least squares – Fitting of straight lines – Fitting of second degree curves and exponential curves.

Correlation : Definition – Karl Pearson's coefficient of correlation – Measures of correlation – Rank correlation coefficients.

Regression : Simple linear regression – Regression lines and properties.

Learning outcome: At the end of this unit, student will be able to

- Understand the concept of Principle of least squares for curve fitting of straight line ,second degree curve and exponential curve(L_2)
- Calculate Pearson's correlation coefficient, Spearman's rank correlation coefficient (L_3)
- Compute and interpret simple linear regression between two variables (L_3)
- Calculate regression coefficients and study the properties of regression lines (L_3)

UNIT – IV : TESTING OF HYPOTHESIS [14 Periods]

Introduction – Null hypothesis – Alternative hypothesis – Type –I, II errors – Level of significance – Critical Region – Confidence interval – One sided test – Two sided test,
Small Sample Tests : Students t - distribution , its properties – Test of significance difference between sample mean and population mean – Difference between means of two small samples – F- Distribution – Test of equality of two population variances – Chi-square test of goodness of fit .

Large sample Tests : Test of Significance of Large Samples – Tests of significance difference between sample proportion and population proportion & difference between two sample proportions – Tests of significance difference between sample mean and population mean & difference between two sample means.

Learning outcome: At the end of this unit, student will be able to

- Formulate null & alternate hypothesis, identify type I & type II errors(L_6)
- Formulate, calculate and interpret hypotheses test for one parameter and to compare two parameters, for both large and Small samples, Z and T for one two samples (L_6)
- Perform and analyze hypotheses tests of means, proportions and variances using both one- and two-sample data sets (L_4)
- apply the appropriate Chi-Squared test for independence and goodness of fit(L_3)

UNIT – V : QUEUING THEORY [10 Periods]

Structure of a queuing system – Operating characteristics of queuing system – Transient and steady states – Terminology of queuing systems – Arrival and service processes – Pure Birth-Death process Deterministic queuing models – M/M/1 Model of infinite queue – M/M/1 model of finite queue.

Learning outcome: At the end of this unit, student will be able to

- Explain pure birth and death process(L_5)
- Analyze M/M/1 model and solve traffic flow problems of M/M/1 model(L_4)
- understand various elements of a queuing system and each of its description(L_2)

TEXT BOOK

1. **T. .Veerarajan** , "*Probability, Statistics and Random Processes"* , Tata McGraw Hill Publications.

REFERENCE BOOKS

1. **Kishor S. Trivedi** , "*Probability & Statistics with Reliability, Queuing and Computer Applications*" , Prentice Hall of India .
2. **Dr. B.S Grewal**, "*Higher Engineering Mathematics",* Khanna Publishers.
3. **Sheldon M.Ross,** *"Probability and Statistics for Engineers and Scientists",* Academic Press.
4. **S C Gupta and V. K. Kapoor, "***Fundamentals of Mathematical Statistics*".