Probability & Statistics

Course Code	24MA4101		
Course Category:	**Basic Sciences (BS)**	**Credits:**	03
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3-0-0
Prerequisites:	10+2 Mathematics	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE DESCRIPTION

An overview of the random variables, discrete & continuous probability distributions, Inference concerning means, variance, proportions and non parametric tests with a focus on their applications in solving engineering problems.

COURSE OBJECTIVES

- Fundamentals of probability and cover discrete probability distributions such as Binomial and Poisson.
- Teach continuous random variables and continuous probability distributions, including Normal, Normal approximation and Joint probability distributions.
- Explain the concepts of sample and population, point and interval estimations, and hypothesis testing for one and two means.
- Discuss the estimation of variances, Proportions, Hypothesis testing for one and two variances, as well as proportions, r x c analysis.
- Introduce and discuss about Non Parametric tests like The Sign Test, Rank-Sum tests, Correlation based on ranks, Tests of Randomness.

COURSE OUTCOMES

At the end of the course, the student will be able to

CO1: Apply discrete random variables to determine probability distributions like Binomial and Poisson for decision-making (K3)

CO2: Apply continuous random variables to the normal distribution, approximate the binomial distribution using the normal distribution, and joint probability distributions. (K3).

CO3: Implement point and interval estimation methods to estimate population parameters and test hypotheses concerning the one and two means (K3).

CO4: Utilize interval estimation to estimate variances and proportions, testing of hypotheses concerning variances and proportions (K4).

CO5: Apply some Non parametric tests and assess correlation based on ranks as well as test of randomness. (K3)

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		2									
CO2	3	3		2									
CO3	3	3		2									
CO4	3	3		2									
CO5	3	3		2									

COURSE CONTENT

Unit – I: Probability Distributions (Discrete):

Random Variables, Binomial distribution, Hyper Geometric Distribution, Poisson approximation to the Binomial distribution, Poisson process.

Description: This unit introduces students to the concept of discrete random variable and discrete probability distributions Binomial and Poisson for decision making.

Learning Outcome: able to determine mean and variance of discrete random variables.

- able to find the probability with respect to binomial and Poisson distributions.

Web Resources:

https://www.youtube.com/watch?v=UftY0e2ilM4

Unit – II : Probability Distributions (Continuous) & Joint Probability:

Probability Densities: Continuous random variables, Normal distribution, Normal approximation to the Binomial distribution.

Joint distribution: Joint Distributions-Discrete and Continuous.

Description: This unit covers continuous random variable and its properties, normal probability distribution and joint probability distributions.

Learning Outcome: able to find statistical parameters mean, variance and standard deviation in case of continuous random variables.

- able to determine distribution function using density function and vice versa of normal probability distribution and determine joint probability distributions.

Web Resources:

http://acl.digimat.in/nptel/courses/video/106105239/L12.html

Unit – III: Hypotheses Concerning Mean:

Inferences Concerning a Mean: Point Estimation, Interval Estimation, Tests of Hypotheses, Null Hypotheses and Tests of Hypotheses, Hypotheses concerning one mean, Relation between tests and confidence intervals, Comparisons-Two independent large samples, Comparisons-Two independent small samples.

Description: This unit focuses on the concepts of sample, population and estimation of population mean and testing the hypothesis concerning one and two means of population.

Learning Outcome: able to find the confidence interval, maximum error.

- able to apply the testing of hypothesis concerning mean to take decision regarding estimated population mean.

Web Resources:

https://www.youtube.com/watch?v=IEP3swFeauE

Unit – IV: Hypotheses Concerning Variances and Proportions:

Inferences Concerning Variances: Estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances.

Inferences Concerning Proportions: Estimation of Proportions, Hypotheses concerning one Proportion, Hypotheses concerning several Proportions, The analysis of r x c tables.

Description: This unit introduces testing of hypothesis concerning one & two variances, proportions. Hypothesis concerning several proportions, r x c analysis.

Learning Outcome: able to evaluate confidence interval and maximum error.

- apply several proportions, r x c analysis to take decisions various engineering and social problems.

Web Resources:

https://archive.nptel.ac.in/courses/103/106/103106120/

Unit – V: Non Papametric Tests:

Non Parametric Tests: Introduction, The Sign Test, Rank-Sum tests, Correlation based on ranks, Tests of Randomness.

Description: This unit covers non parametric tests like The Sign Test, Rank-Sum tests, Correlation based on ranks, Tests of Randomness.

Learning Outcome: able to understand to attain the best possible precision when the data is doubtful whether the assumption of normality can be met.

Web Resources:

Non-parametric Statistical Inference - Course

TEXT BOOK(S):

[1]. Probability and Statistics for Engineers, Eighth edition by Richard A. Johnson Prentice Hall of India.

REFERENCE BOOKS:

[1]. Probability & Statistics for Engineers & Scientist by R.E. Walpole, R.H.Myers&S.L.Myers, Sixth Edition, Prentice Hall of India / Pearson Education.

[2]. Probability and Statistics, Purna Chandra Biswal, Pearson Education Prentice Hall of India 2007.

[3]. Probability and Statistics by T.K.V.Iyengar, B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.Prasad S.Chand.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.youtube.com/watch?v=UftY0e2ilM4

[2] http://acl.digimat.in/nptel/courses/video/106105239/L12.html

[3] https://archive.nptel.ac.in/courses/103/106/103106120/

[4] Non-parametric Statistical Inference - Course