COURSE TITLE	**PROBABILITY AND STATISTICS**
COURSE CODE	**01AI1301**
COURSE CREDITS	**4**

Objective:

1 This course exposes students to probability and statistics which is essential for their subsequent studies of Artificial intelligence and big data. The objective is to teach theoretical concepts and techniques for solving practical problems. Starting with probability, this course leads to the concepts of correlation, regression, estimation and testing of hypothesis.

Course Outcomes: After completion of this course, student will be able to:

1 Students will be able to understand the basic concepts of probability and independence

2 Students will be able to understand random variables and special probability distributions.

3 Students will able to calculate and interpret the correlation between two variables.

4 Students will able to calculate confidence interval for a population parameter for single sample and two sample cases.

5 Students will able to apply various tests of Hypothesis as well as learn non-parametric test such as the Chi-Square test for Independence and Goodness of Fit.

Pre-requisite of course: Basic knowledge of combination and permutation, basic probability.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Probability** Sample space and events, definitions of probability, properties of probability, conditional probability, Bayes' theorem and independence	6
2	**Random variable Probability distribution** Discrete and continuous random variable, distribution functions, moments of random variables, functions of random variable, Some special probability distributions, Binomial distribution, Poisson distribution, Exponential distribution, law of large numbers, Central Limit Theorem , Normal distribution	10

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Contents : Unit	Topics	Contact Hours
3	**Correlation and regression analysis** Definition, Assumption of Correlation, Bivariate Correlation, Partial Correlation, Correlation Coefficients: Pearson, Assumption of Regression Analysis, Simple Regression Model, Multiple Regressions Model, Coefficient of regression and their properties,, , Applications of the concepts in engineering	12
4	**Estimation** Random sampling, Estimation of parameters, confidence intervals for proportions, confidence intervals for parameters in one sample and two sample problems of normal populations.	5
5	**Testing of Hypotheses** Null and alternative hypotheses, the critical and acceptance region, two types of errors, Test of significance for large samples: z- test for single proportion test, Difference of proportions test, Single mean, Difference of means, and Difference of standard deviations test, Test of significance for small samples: t- Test for single mean, difference of means, t-test for correlation coefficients, F- test for ratio of variances, Chi square goodness of fit test and its applications	12
Total Hours		**45**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Tutorial 1 Introduction to Probability** Introduction to probability	6
2	**Tutorial 2 Random variable Probability distribution** Random variables, Probability distributions	2
3	**Tutorial 3 Correlation and regression analysis** Correlation, Regression analysis	2
4	**Tutorial 4 Estimation** Estimation	1
5	**Tutorial 5 Testing of Hypotheses** Large sample test, Small sample test	2
Total Hours		**13**

Textbook :

1 Probability and Statistics for Engineers, Richard A Johnson, Miller and Freund, Pearson, 2016

References:

1 Introduction to Probability and Statistics for Engineers and Scientists, Introduction to Probability and Statistics for Engineers and Scientists, S. M. Ross, Elsevier Science, 2020

2 Introduction to Probability and Statistics, Introduction to Probability and Statistics, J.S. Milton & J. C. Arnold, McGraw Hill Higher, 2022

References:

3 Introduction to Probability Theory and Statistical Inference, Introduction to Probability Theory and Statistical Inference, H.J. Larson, Wiley, 1982

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
25.00	30.00	30.00	15.00	0.00	0.00

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1. https://en.wikipedia.org/wiki/Probability_and_statistics
2. https://www.britannica.com/science/probability