COURSE TITLE	**PROBABILITY AND STATISTICS**
COURSE CODE	**01CE0309**
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 Understand Basic probability concepts such as conditional probability, independence, and Bayes' theorem.

2 Apply probability distributions to solve problems involving random variables

3 Apply correlation and regression techniques to examine and interpret relationships between variables in engineering contexts.

4 Apply estimation techniques and construct confidence intervals in engineering problems

5 Analyze hypothesis tests and evaluate model fit using statistical methods.

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	1	0	50	30	20	0	0

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, Exponential, Poisson, Binomial and Normal distribution, law of large numbers; and central limit theorem.	10

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Contents : Unit	Topics	Contact Hours
3	**Correlation and regression analysis** Definition, Assumption of Correlation, Definition, Assumption of Correlation, 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 regions, two types of error, Test of significance for large samples: z-testfor single proportion, Difference of proportions, Single mean, Difference of means, and Difference of standard deviations, 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** Basic Probability	1
2	**Tutorial 2** Example of total probability & Bayes theorem	1
3	**Tutorial 3** Examples of Random variables	1
4	**Tutorial 4** Examples of Binomial distribution	1
5	**Tutorial 5** Examples of Poisson distribution	1
6	**Tutorial 6** Examples of Normal distribution	1
7	**Tutorial 7** Examples of moments	1
8	**Tutorial 8** Examples of correlation	1
9	**Tutorial 9** Examples of regression	1
10	**Tutorial 10** Examples of small sample about mean	1
11	**Tutorial 11** Examples of small sample about variance	1

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
12	**Tutorial 12** Examples of large sample about mean	1
13	**Tutorial 13** Example of large sample F test	1
14	**Tutorial 14** Example of chi square test	1
Total Hours		**14**

Textbook :

1 Miller and Freund's Probability and Statistics for Engineers, : Richard A Johnson, Prentice Hall of India, 2018

2 Introduction to Probability and Statistics, J.S. Milton & J. C. Arnold, Cengage Learning, 2008

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

References:

1 Introduction to Probability and Statistics for Engineers and Scientists, Introduction to Probability and Statistics for Engineers and Scientists, S. M. Ross, Academic Press, 2009

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

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Supplementary Resources:

1 https://onlinecourses.nptel.ac.in/noc21_ma74/preview

2 https://nptel.ac.in/courses/111105041

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