Department of Mathematics & Computing
Lecture Plan, Session: 2020-21 (Monsoon Semester)

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	MCC505	Probability and Statistics	3	0	0	9

Course Objective
To offer a foundation in probability theory and statistical inference in order to solve applied problems and to prepare for more advanced courses in probability and statistics.
Learning Outcomes
This course provides a solid undergraduate foundation in both probability theory and mathematical statistics and at the same time provides an indication of the relevance and importance of the theory in solving practical problems in the real world.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Definition of statistics, types of data, concept of frequency distributions. Measures of Central Tendency: Mean, Median, Mode, Quintiles. Measures of Dispersion: Range, Mean Absolute Deviation, Standard deviation, variance, Covariance, Coefficient of Variation & moments, relation between first four central and raw moments. Skewness and kurtosis: measures of skewness and kurtosis	5	To understand the nature and deviation of data.
2	Events, sample space, definitions of Probabilities. Theorems of Probabilities (without proof): Addition, Conditional Probability & Multiplication, Bayes theorem and its proof with application based on numerical problems. Random variables; discrete and continuous, probability functions: pmf & pdf, Joint, marginal & conditional probability distributions. Mathematical expectation and its properties. Moment generating & characteristic functions. Exercises based on above topics	10	To understand the logic of probability. To find the descriptive statistics of distribution through moment generation function.
3	Statements (without proof) of Markov and Chebyshev inequalities and its applications based on numerical problems. Statements of Law of large numbers: WLLN, SLLN, Central limit theorem. Numerical problems based on above topics	4	To obtain the different probability bounds of data.
4	Definitions, MGF, mean and variance of the following Probability distributions: Discrete: Uniform, bernoulli, binomial, negative binomial, geometric, hyper geometric, Poisson probability distributions. Continuous: Uniform, normal, lognormal, cauchy, exponential, gamma, beta, weibul probability distributions. Definitions & uses of sampling distributions: Chi-square, t and F, distributions of smallest and largest order statistics and range	14	To Understand the concepts of a random variable and analyze the ideal patterns of data.

5	Definition of Karl Pearson correlation coefficient and its properties for bivariate data, Spearmen rank correlation coefficient with examples. Concept & derivations of regression lines, properties of regression coefficients. Plane of regression (three variables case) & derivation of regression coefficients. Definitions (without proof) of multiple and partial correlation coefficients and numerical problems.	6	To know the relationship between variables and predict (estimate) the value of dependent variable.

Text Books:

1. Sheldon M. Ross, First Course in Probability, A, 9th Edition, Pearson, Boston, 2014.
2. V.K. Rohatgi and A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, John Wiley & Sons, 3rd Edition, 2015

Reference Books:

1. Hogg, R.V., McKean, J.W. and Craig, A.T., Introduction to Mathematical Statistics. 7th Edition, Pearson, Boston, 2013.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics (A Modern Approach) 10th Edition, Sultan Chand & Sons, 2002.

(Shuvashree Mondal)	(Gajendra K. Vishwakarma)	(Subhashis Chatterjee)	(G.N. Singh)
Assistant Professor	Assistant Professor	Professor	Professor