Approval: 10th senate meeting

Course Name	: Probability and Statistics
Course Number	: MA-524
Credit	: 3-1-0-4
Prerequisites	: NA
Students intended for	: M.Sc. /M.S./Ph.D. /B.Tech 3rd and 4th year
Elective or core	: Core for M.Sc. in applied Mathematics and Elective for other discipline.
Semester	: Odd/Even

Course Objective: The main objective of this course is to provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.

Probability and random variable : σ field; measurable space; construction of measure probability and properties; definitions, scope and examples of probability; sample spaces and events; axiomatic definition of probability; joint and conditional probabilities; independence, total probability; Bayes' rule and applications. **[8L]**

Definition of random variables, continuous and discrete random variables; cumulative distribution function (cdf) for discrete and continuous random variables; probability mass function (pmf); probability density functions (pdf) and properties; expectation: mean, variance and moments of a random variables. [**5L]**

Distribution Functions : Some special distributions: uniform, exponential, Chi-square, Gaussian, binomial, and poisson distributions; Law of large numbers; Central limit theorem and its significance. [**7L]**

Statistics: Scatter diagram; graphical residual analysis, Q-Q plot to test for normality of residuals, autocorrelation and autocovariance functions; stationarity and non stationarity ; correlation and covariance [**6L]**

Sampling distributions; point and interval estimation, testing of hypothesis, Goodness of fit and contingency tables, linear regression, ANOVA. [**12L]**

Introduction to Stochastic process; white noise; random walk and Brownian motion [**4L]**

Text Books

1. Sheldon M. Ross, "***Introduction to Probability and Statistics for Engineers and Scientists"***, Academic Press, (2009).

Reference Books

1. D. C. Montgomery and G.C. Runger, "***Applied Statistics and Probability for Engineers***", 5th edition, John Wiley & Sons, (2009).
2. Robert H. Shumway and David S. Stoffer, "***Time Series Analysis and Its Applications with R Examples***", Third edition, Springer Texts in Statistics, (2006).