Course Code	MTH 201
Course Name	Probability and Statistics
Credits	4
Course Offered to	UG - First year
Course Description	The course introduces students to probability theory and how it can be applied to statistical problems. They learn about probabilistic models that occur in common applications. They are introduced to probability mass and density functions and statistics like expectation, correlation, and covariance. This is followed by an introduction to sampling statistics like the sample mean and variance, statistical hypothesis testing, and parameter estimation.

Pre-requisites	
Pre-requisite (Mandatory)	Pre-requisite (Desirable)
	None

*Please insert more rows if required

Post Conditions*(For suggestions on verbs please refer the second sheet)

CO1	CO2	CO3	CO4	CO5
Students are able to derive first and second order statistics, conditional PDF(s) and PMF(s), of common random variables and functions of the same.	Students are able to apply commonly found discrete and continuous state probabilistic models to various applications, as captured by word problems	Students are able to derive properties of the sample mean and variance of samples from a normal population	Students are able to derive estimates of the parameters of common probability distributions and test hypothesis from random samples	Students are able to perform MATLAB (or equivalent) experiments to present data, generate data from distributions, calculate various statistics, and demonstrate basic hypothesis testing

Weekly Lecture Plan

Week Number	Lecture Topic	COs Met	Assignment/Labs/Tutorial
1,2	Set Theory, Experiments, Observations, Axioms of Probability, classical and frequentist methods, describing data sets, conditional probability, Bayes' rule, law of total probability, tree diagrams	C01, C02, C05	Word Problems as in SR and RY. MATLAB experiments as in RY: Plotting histograms, generating random numbers and etc. Tutorial on MATLAB SR: Textbook by Sheldon Ross; RY: Text Book by Roy Yates
2,3	Counting, Discrete RV, PMF, Common Discrete RV models, CDF, Expectation, Functions of Discrete RV, Second order statistics, Conditional PMF	C01, C02, C05	Word Problems as in SR and RY. MATLAB experiments
3,4	Discrete to Continuous RV, CDF, PDF, Expectation, Commonly used models, Functions of continuous RV, RV(s) as functions of Gaussian RV, Conditioning, Sample mean and variance from data, Moment generating functions	C01, C02, C05	Word Problems as in SR and RY. MATLAB experiments
4,5	Pairs of RV(s), Joint and marginal PMF and PDF. Independence, Correlation, Covariance, Scatter Plots, Calculating from data sets, Expected value of sum of two RV(s)	C01, C02, C05	Word Problems as in SR and RY. MATLAB experiments
5,6	Extension of pairs to vectors of RV(s), Vector representation, Independence, Expected value and covariance of sums of RV(s)	C01, C02, C05	Word Problems as in RY
7,8	Chebyshev Inequality, Sample mean and variance, Central Limit Theorem (Statement, intuition and application), Weak Law of Large Numbers (Statement, intuition and application), Sampling from a normal population, Sampling from a finite population	C03, C05	Word problems as per RY and SR. MATLAB experiments showing convergence
9,10	Maximum Likelihood Estimation, Interval estimates, Point estimator properties, Bayes estimator	C04, C05	Word Problems as in SR and RY. MATLAB Experiments
11,12	Hypothesis Testing, Tests concerning Normal, Bernoulli and Poisson	C04, C05	Word Problems as in SR and RY. MATLAB experiments
13	Revision/Overflow Week		

*Please insert more rows if required

Weekly Lab Plan

Week Number	Laboratory Exercise	COs Met	Platform (Hardware/Software)
	No Labs		

*Please insert more rows if required

Assessment Plan

Type of Evaluation	% Contribution in Grade
Quiz	25
Mid-sem	25
Assignment	20
End-sem	30

*Please insert more row for other type of Evaluation

Resource Material

Type	Title
Textbook	Probability and Stochastic Processes (2nd Ed) By Roy Yates and David Goodman
Textbook	Introduction to Probability and Statistics for Scientists and Engineers By Sheldon Ross (5th Ed)