

PROGRAMME NAME: : B.Sc(H) Mathematics

COURSE NAME : Probability Theory and Statistics

SEMESTER DURATION: July to December

Week	Topic(s)	Teaching Methodology Adopted/ Continuous Internal Evaluation
1.	Sample space, Probability set function and examples, Random variable.	Lectures/Discussion
2.	Probability mass/density function, Cumulative distribution function and its properties.	Lectures
3.	Discrete and continuous random variables, and Transformations.	Lectures
4.	Expectation of random variables, and some special expectations: Mean, Variance, Standard deviation, Moments and moment generating function, Characteristic function.	Lectures/Assignments
5.	The discrete distributions - Uniform, Bernoulli and binomial.	Lectures/Assignments
6.	The discrete distributions - negative Binomial, Geometric and Poisson.	Lectures/Assignments
7.	The continuous distributions - Uniform, Gamma, Exponential, Chi-square and Beta.	Lectures
8.	Normal distribution, and normal approximation to the binomial distribution.	Group Discussions
9.	Random vector: Discrete and continuous, Joint cumulative distribution function and its properties.	Lectures
10.	Joint probability mass/density function, Marginal probability mass function, and expectation of two random variables, Joint moment generating function, Conditional distributions and expectations.	Lectures
11.	The Correlation coefficient, Covariance, Calculation of covariance from joint moment generating function, Independent random variables.	Lectures
12.	Linear regression for two variables, and the method of least squares.	Lectures/Assignments
13.	Bivariate normal distribution; Chebyshev's theorem.	Lectures/Assignments
14.	Statement and interpretation of the strong law of large numbers, Central limit theorem and the weak law of large numbers.	Lectures/Assignments

Course Objectives: To make the students familiar with the basic statistical concepts and tools which are needed to study situations involving uncertainty or randomness. The course intends to render the students to several examples and exercises that blend their everyday experiences with their scientific interests.

Course Learning Outcomes: This course will enable the students to learn:

- i) Distributions to study the joint behavior of two random variables.
- ii) To establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression.
- iii) Central limit theorem, which helps to understand the remarkable fact that: the empirical frequencies of so many natural populations, exhibit a bell shaped curve.