Course Title:	Probability Theory & Applications
Course Code:	STAT-102
Semester:	II
Credit Hours:	3 Credit Hours
Pre-requisites:	Introduction to Statistics

Learning Outcomes

By the end of this course, students will have:

1. The understanding of basic probability and its laws.
2. The idea of discrete and continuous random variables and their probabilistic models.
3. The knowledge of discrete and continuous probability distributions along with their practical applications.

Course Outline

Unit 1

1.1 Preliminaries

Random experiments, sample space and events. Counting techniques. Definitions and axioms of probability. Basic laws of probability. Independence of events. Bayes Theorem and its application. Random variable, distribution function,

Unit 2

2.1 Discrete random variable

Probability distribution of a discrete random variable. Joint distribution of two discrete random variables, marginal and conditional distributions, mathematical expectation and its properties, mean, variance and moments. Bernoulli trail and applications of Binomial distribution with examples.

2.2 Continuous random variable

Probability distribution of a single continuous random variable, probability density function and distribution function. Mean, variance and moments of continuous random variables. Mean, variance, shape and properties of Normal distribution. Fitting of Normal distribution by area method.

- **Teaching-learning Strategies:**
  Class Lecture method, which includes seminars, discussions, assignments and projects. (Audio-visual tools are used where necessary)

- **Assignments-Types and Number with calendar:**
  According to the choice of respective teacher.

- **Assessment and Examinations:**
  According to the University's Semester Rules.

Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	It takes place at the mid-point of the semester.
2	Formative Assessment	25%	It is continuous assessment. It includes: Classroom participation, attendance, assignments, and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

Text Books

1. Bluman. (2011). *Elementary Statistics* (8th ed.). McGraw Hill, New York.
2. Chaudhry, S.M., & Kamal, S. (2010). *Introduction to Statistical Theory Part I*, Ilmi Kitab Khana, Urdu Bazar, Lahore.

Suggested Readings

1. Beg, M.A., & Mirza, M.D. (2006). *Statistics, Theory and Methods*, Volume I, Carvan Book House, Kutechery Road, Lahore
2. Crawshaw, J., & Chambers, J. (2014). *A concise course in advanced level Statistics with worked examples*. Nelson Thornes, Revised Edition.
3. Johnson, R.A., & Wichern, D.W. (2003). *Business Statistics: Decision making with data.* John Wiley & Sons Inc.
4. Macfie, B.P., & Nufrio, P.M. (2006). *Applied Statistics for public policy*. Prentice Hall of India.
5. Medhi, J. (2006). *Statistical Methods: An Introductory text*, New Age International Publishers.
6. Levine, D.M., Kschbiel, T.C. & Berenson, M.L. (2009). *Business Statistics: A first course* (5th ed.). Pearson Education.
7. Levin, J. & Fox, J.A. (2013). *Elementary Statistics in Social Research* (12th ed.). Pearson Education.