

**Semester IV**  
**Statistics for Economics**  
**ECODSC – 253**  
**Total Credits: 3**  
**Contact hours: 45 hours**

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**Course Description:**

This is a course on statistical methods for economics. It begins with some basic concepts and terminology that are fundamental to statistical analysis and inference. It then develops the notion of probability, followed by probability distributions of discrete and continuous random variables and of joint distributions. This is followed by a discussion on sampling techniques used to collect survey data. The course introduces the notion of sampling distributions that act as a bridge between probability theory and statistical inference. The semester concludes with some topics in statistical inference that include point and interval estimation and hypothesis testing.

**Course Outcome:**

At the end of the course, the students will be able to gain the essential knowledge of the theory and the key properties of probability and random variables. They will be able to understand the logic and framework of the inference of hypothesis testing. It sets a necessary foundation for the econometric courses. An important learning outcome of the course will be the capacity to analyse statistics in everyday life.

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**Unit 1: Measures of Central Tendency and Dispersion**

Measures of Central Tendency - Mean, Median, Mode; Measures of Dispersion; Skewness and Kurtosis; the Use of Measures of Location and Variation

**Unit 2: Elementary Probability Theory**

Random Experiment; Sample Spaces and Events; Probability Axioms and Properties; Conditional Probability and Independence of events; Addition Theorem of Probability and Multiplication Theorem of Probability; Bayes' Theorem.

**Unit 3: Random Variables and Probability Distributions**

Defining Random Variables; Probability Mass Function, Probability Density Function, Cumulative Probability Function; Mathematical Expectation of Random Variables; Theorem on Expectation; Properties of commonly used Discrete and Continuous Distributions (Binomial, Normal and Poisson Random Variables).

**Unit 4: Sampling Theory and Design of sample Surveys**

Population and sample, census versus sampling, types of sampling, random and non-random sampling, random sampling with and without replacement, laws of sampling, principal steps in sample survey, sampling and non-sampling error, Parameter and Statistic; sampling distribution and Standard Error, Limitations of Sampling.

**Unit 5: Theory of Estimation and Testing of Hypothesis**

Point Estimation and Interval estimation, Characteristics of a good Estimator, Sampling Distribution of a Statistic, Concepts of Test of Hypothesis and Significance, Large sample Tests, Z test, Chi-Square Test of Goodness of fit, Test of Significance based on t and F Distributions.

**Suggested Readings:**

1. Jay L. Devore, Probability and Statistics for Engineers, Cengage Learning, 2010.
2. John E. Freund, Mathematical Statistics, Prentice Hall, 1992.
3. Richard J. Larsen and Morris L. Marx, An Introduction to Mathematical Statistics and its Applications, Prentice Hall, 2011.
4. S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 2023.
5. William G. Cochran, Sampling Techniques, John Wiley, 2007.

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