

## Generic Elective (GE) Courses

### Generic Elective (GE) Course 4a: Inferential Techniques

Structure 1: PG Curricular Structure with only Course Work  
Structure 2: PG Curricular Structure with Course Work + Research

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Prerequisite of the course (if any)
		Lecture (45 Hours)	Tutorial (15 Hours)	Practical (00 Hours)		
GE 4a: Inferential Techniques	4	3	1	0	NIL	NIL

#### Course Objectives:

- To arrive at an estimator that exhibits optimality.
- To introduce the basic elements of statistical inference.
- To provide a theory of testing and closely related theory of point estimation and confidence sets, together with their applications.

**Course Learning Outcomes:** On successful completion of this course, the students will be able to:

- Describe the methods of estimation and hypothesis testing.
- Understand the various estimation and testing procedures to deal with real life problems.
- Understand the concept of critical regions, likelihood ratio test with its asymptotic distribution.
- Learn about the Fisher Information, lower bounds to variance of estimators, MVUE.

#### Unit I (11 Hours)

Concept of estimation theory, estimate and estimator, properties of good estimator: unbiasedness, efficiency consistency and sufficiency. C.R. inequality and minimum variance unbiased estimator (MVUE). Examples based on discrete and continuous distributions.

#### Unit II (11 Hours)

Methods of estimation: Method of moments, method of maximum likelihood (statement and properties) and method of minimum chi-square. Interval estimation: Concepts of confidence interval.

**Unit III (12 Hours)**

Testing of Hypotheses: Statistical hypotheses, null and alternative hypotheses, simple and composite hypotheses, critical region, error of type I and type II, size and power of a test and p-value. Test of significance based on normal distribution (tests for single proportion, difference of two proportions, single mean and difference of two means).

**Unit IV (11 Hours)**

Test for single mean, difference of two means, paired t-test, test for sample correlation coefficient based on t-distribution Tests based on Chi-square distribution and F-distribution.

**Tutorial**

Tutorial sessions will include at least one activity such as group discussion/presentation/ problem solving exercise based on the material covered in the lectures along with scholastic work related to the conceptual understanding of the subject.

**Essential Readings:**

1. Casella, G. and Berger, R.L. (2013). *Statistical Inference*, Cengage Learning.
2. Goon, A.M., Gupta, M.K. and Dasgupta, B (2005): *An Outline of Statistical Theory-Vol. II*, World Press Private Limited, Kolkata.
3. Hogg, R.V., McKean, J. W. and Craig A.T. (2019). *Introduction to Mathematical Statistics*, Pearson.
4. Kale, B.K. (2005). *Parametric Inference*, Narosa Publishing House.
5. Mukhopadhyay, P. (2016). *Mathematical Statistics*, New Central Book Agency.

**Suggested Readings:**

1. Kumar, U.D. (2017): *Business Analytics: The Science of Data-Driven Decision Making*, John Wiley & Sons.
2. Mood, A., Graybill, F. and Boes, B. (2017). *Introduction to the Theory of Statistics*, Mc-Graw Hill.
3. Rohatgi V.K. and Saleh, A.K.Md.E. (2015): *An Introduction to Probability and Statistics*, John Wiley & Sons.