

B.Sc. (P)/B.A(P) with Statistics as Major

Category II

DISCIPLINE SPECIFIC CORE COURSE-7: ELEMENTS OF STATISTICAL INFERENCE

CREDIT DISTRIBUTION, ELIGIBILITY, AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the Course			Eligibility Criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/ Practice		
Elements of Statistical Inference	4	3	0	1	Class XII with Mathematics	Basic probability, probability distributions and sampling distributions

Learning Objectives:

The learning objectives of this course are as follows:

- To understand the concept of estimation theory and testing of hypothesis.
- To draw inferences about the unknown population parameters based on random samples.
- To validate the estimation/ inference about the population using hypothesis testing.

Learning Outcomes:

After successful completion of this course, students will be able to:

- Understanding of estimation theory, Point and interval estimations.
- Characteristics of a good estimator and different methods of estimation.
- Demonstrate the use of these techniques in data analysis.
- Develop the best/most powerful statistical tests to test the hypotheses regarding unknown population parameters by using Neyman-Pearson theory.

SYLLABUS OF DSC-7

Theory

UNIT I

(15 hours)

Estimation Theory

Parameter space, sample space, point estimation, requirement of a good estimator, consistency, unbiasedness, efficiency, sufficiency, Minimum variance unbiased estimators, Factorization theorem, Fisher- Neyman Criterion: statement and applications, Cramer- Rao inequality:

statement and application, MVB estimators and their applications, Statement of Rao-Blackwell theorem and Lehmann-Scheffe theorem..

UNIT II

(15 hours)

Method of Estimation

Maximum likelihood, least squares and minimum variance, Properties of maximum likelihood estimators (illustration), Interval Estimation: confidence interval and confidence limits for the parameters of normal distribution, confidence intervals for large samples.

UNIT III

(15 hours)

Test of Significance

Principles of test of significance: Null and alternative hypotheses, simple and composite, Type-I and Type-II errors, critical region, level of significance, power of the test, best critical region, most powerful test, uniformly most powerful test, uniformly most powerful unbiased (UMPU) critical region, Neyman- Pearson Lemma: statement and its applications to construct most powerful test.

PRACTICAL / LAB WORK – 30 hours

List of Practical

Practical Based on:

1. Unbiased estimators and consistent estimators.
2. Efficient estimators and relative efficiency of estimators.
3. Sufficient estimators and factorization theorem.
4. Cramer- Rao inequality and MVB estimators.
5. Method of maximum likelihood estimation.
6. Method of least squares and minimum variance.
7. Confidence interval and confidence limits for the parameters of normal distribution.
8. Confidence intervals in case of large samples.
9. Type I and Type II errors, power of the test.
10. Most powerful critical region (NP Lemma).

Practical work to be conducted using electronic spreadsheet / EXCEL/ Statistical Software Package/ SPSS/ calculators.

ESSENTIAL READINGS:

- Gupta, S.C. and Kapoor, V. K. (2020): Fundamentals of Mathematical Statistics, 12th Ed., Sultan Chand and Sons.
- Miller, I. and Miller, M. (2013). John E. Freund's Mathematical Statistics, 8th Ed., Prentice Hall of India.
- Hogg, R. V., Craig, A. T., and McKean, J. W. (2005): Introduction to Mathematical Statistics, 6th Edition, Pearson Education.
- Goon, A.K., Gupta, M. K. and Das Gupta, B. (2003): An Outline of Statistical Theory (Vol. II), 4th Edition., World Press, Kolkata.

SUGGESTED READINGS:

- Rohtagi, V. K. and Md., A. K. Saleh, E. (2009): An Introduction to Probability and Statistics, 2nd Edition, John Wiley and Sons.
- Casella, G. and Berger, R. L. (2002): Statistical Inference, 2nd Edition, Thomson Duxbury.
- Mood A.M., Graybill F.A. and Boes D.C. (1974). Introduction to the Theory of Statistics, McGraw Hill.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch University of Delhi, from time to time.

DISCIPLINE SPECIFIC CORE COURSE-8: INTRODUCTION TO VITAL STATISTICS AND DEMOGRAPHY

CREDIT DISTRIBUTION, ELIGIBILITY, AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the Course			Eligibility Criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/ Practice		
Introduction to Vital Statistics and Demography	4	3	0	1	Class XII with Mathematics	knowledge of basic statistics

Learning Objectives:

The learning objectives of this course are as follows:

- To collect valid Demographic data using different methods.
- To learn basic measures of Mortality, Fertility, and Population Growth.
- To construct life tables.

Learning Outcomes:

After successful completion of this course, students will be able to:

- Distinguish between Vital Statistics and Demography.
- Understand errors in Demographic data.
- Comprehend sources of data collection on Vital Statistics and errors therein.
- Use methods for measurement of Population.
- Distinguish between Rate and Ratio.
- Understand the basic measures of Mortality.
- Describe and apply the concepts of Stable and Stationary Populations.
- Understand the concept of Life Tables and their construction.
- Understand the basic measures of Fertility.
- Apply measures of Population Growth.