

DEPARTMENT OF STATISTICS
B. Sc. (H) Statistics
SEM-VI

Category I

DISCIPLINE SPECIFIC CORE COURSE – 16: TESTING OF HYPOTHESIS

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		
Testing of Hypothesis	4	3	0	1	Class XII pass with Mathematics	knowledge of sampling distributions

Learning Objectives

The learning objectives of this course are to introduce:

- Hypothesis testing as a statistical procedure for testing whether chance is a plausible explanation of a random experiment
- The logic of hypothesis testing with focus on theory and implementation of hypothesis testing with knowledge about types of error type, power and the correct computation and interpretation of p-values
- Use of nonparametric test as an alternative when assumptions of parameterization of distribution or the family itself is violated.
- Sequential Probability Ratio test with its entities like OC Curve, ASN etc.

Learning Outcomes:

After completing this course, students should have developed a clear understanding of:

- The notion of statistical hypothesis test, error and its nature and the idea of acceptance and rejection region.
- Identify simple and composite hypothesis. Find critical region, size and power of the test.
- Apply Neymann-Pearson lemma to find most powerful test. Find UMP and UMPU test. Make use of likelihood ratio principle for testing of hypothesis
- Make distinction between parametric and nonparametric test. Identify suitable nonparametric test for both location and scale (Kolmogorov- Smirnov one sample and two sample tests, sign test, Wilcoxon signed rank test, run test. Median test, Kruskal-Wallis one-way analysis of variance by ranks, Friedman two way analysis of variance by ranks).
- Derive SPRT for test the parameters of normal distribution, binomial and Poisson distributions also find OC function, Average sample Number etc. of a SPRT.

SYLLABUS OF DSC-16

Theory

UNIT I

(15 hours)

Principles of 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, size and power, best critical region, most powerful test, uniformly most powerful test, uniformly most powerful unbiased critical region (UMPU). Neyman Pearson Lemma and its application to construct most powerful tests.

Unit II

(10 hours)

Likelihood ratio test

Likelihood ratio test and its application, properties of likelihood ratio tests (without proof).

UNIT III

(10 hours)

Sequential Probability Ratio Test

Sequential Probability Ratio Test. Determination of stopping bounds A and B, OC and ASN functions of SPRT.

UNIT IV

(10 hours)

Non-Parametric tests

Non-Parametric tests. Empirical distribution function, one sample and two-sample sign test. Wald-Wolfowitz run test. Run test for randomness, Median test, Wilcoxon-Mann-Whitney U-test. Kolmogorov-Smirnov one-sample test, Kruskal-Wallis's test.

PRACTICAL/LAB. WORK(30 hours):

List of Practical

1. Type I and Type II errors
2. Most powerful critical region (NP Lemma)
3. Uniformly most powerful critical region
4. Unbiased critical region
5. Power curves of hypothesis tests.
6. Likelihood ratio test
7. Non Parametric test based on quantile and Empirical distribution
8. Test for location and scale both one and two samples
9. Test of Association for bivariate samples
10. SPRT for binomial, Poisson and Normal distribution
11. OC Curve and ASN function

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

ESSENTIAL READINGS:

- Gun, A.M., Gupta, M.K., and Dasgupta, B. (2005): An Out Line of Statistical Theory, Volume 2, Third Edition.
- Gupta, S.C. and Kapoor, V.K.(2020): Fundamental of Mathematical Statistics, 12th Edn. Sultan Chand and Sons.

SUGGESTIVE READINGS: