B.SC. (P)/B.A(P) WITH STATISTICS AS MAJOR

Category II

DISCIPLINE SPECIFIC CORE COURSE – 1: SAMPLING DISTRIBUTIONS

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		
Sampling Distributions	4	3	0	1	**Passed Passed Class XII with Mathematics**	Statistical Methods

Learning Objectives:

The learning objectives include:

- To understand the concept of sampling distributions and their applications in statistical inference.
- To understand the process of hypothesis testing.
- To have a clear understanding of when to apply various tests of hypothesis about population parameters using sample statistics and draw appropriate conclusions from the analysis.

Learning Outcomes:

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

- Understand the basic concepts of hypothesis testing, including framing of the null and alternative hypotheses.
- Apply hypothesis testing based on a single sample and two samples using both classical and p-value approaches.
- Understand the Chi-square distribution.
- Analyze categorical data by using Chi-square techniques.
- Apply t and F distributions

SYLLABUS OF DSC-5

Theory

Unit I **(15 hours)**

Large sample tests

Large sample tests: Definitions of a random sample, parameter, and statistic, sampling distribution of a statistic, sampling distribution of the sample mean, standard errors of the sample mean, and the sample proportion. Null and alternative hypotheses, level of significance, Type I and Type II errors, their probabilities and critical region. Large sample tests, use of CLT for testing single proportion, difference of two proportions, single mean, difference of two means, standard deviation and difference of standard deviations by classical and p-value approaches.

Unit II **(15 hours)**

Chi-square distribution

Chi-square distribution: Definition and derivation of $\chi 2$ distribution with n degrees of freedom (d.f.) using m.g.f., nature of probability curve for different degrees of freedom, mean, variance, m.g.f., cumulant generating function, mode, additive property and limiting form of $\chi 2$ distribution. Tests of significance and confidence intervals based on χ^2 distribution.

Unit III **(15 hours)**

Exact Sampling Distributions

t and F distributions: Student's t and Fishers t-distributions, Derivation of its p.d.f., nature of probability curve with different degrees of freedom, mean, variance, moments and limiting form of t distribution. Snedecore's F-distribution: Derivation of F distribution, nature of probability curve with different degrees of freedom, mean, variance and mode. Distribution of $1/F(n_1,n_2)$. Relationship between t, F and $\chi 2$ distributions. Test of significance and confidence intervals based on t and F distributions.

PRACTICAL/LAB WORK - 30 hours

List of Practicals

1. Large Sample Tests:
   a) Testing of significance and confidence intervals for single proportion and difference of two proportions.
   b) Testing of significance and confidence intervals for single mean and difference of two means.
   c) Testing of significance and confidence intervals for difference of two standard deviations.
2. Tests based on Chi-Square Distribution:
   a) To test if the population variance has a specific value and its confidence intervals.
   b) To test the goodness of fit.
   c) To test the independence of attributes.
   d) Test based on 2 x 2 contingency table without and with Yates' corrections.
3. Tests based on t- Distribution and F- Distribution:
   a) Testing of significance and confidence intervals for single mean and difference of two means and paired t – test.
   b) Testing of significance and confidence intervals of an observed sample correlation coefficient.
   c) Testing and confidence intervals of equality of two population variances.

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., S. Chand and Sons. Delhi.

● Goon A M, Gupta M K and Dasgupta B (2018): Fundamentals of Statistics, Volume II, 9th Edition and 4th reprint.

● Rohatgi, V. K. and Saleh, A.K. Md. E. (2009). An Introduction to Probability and Statistics, 2nd Ed., (Reprint) John Wiley and Sons.

SUGGESTIVE READINGS:

● Hogg, R.V. and Tanis, E.A. (2009). A Brief Course in Mathematical Statistics. Pearson Education.

● Mood, M.A., Graybill, F.A. and Boes, C.D. (2007). Introduction to the Theory of Statistics, 3rd Ed., (Reprint).Tata McGraw-Hill Pub. Co. Ltd.
● Johnson, R.A. and Bhattacharya, G.K. (2001). Statistics-Principles and Methods, 4th Ed., John Wiley and Sons.

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

DISCIPLINE SPECIFIC CORE COURSE – 6: STATISTICAL QUALITY CONTROL

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		
Statistical Quality Control	4	3	0	1	**Passed Class XII with Mathematics**	Statistical Methods

Learning Objectives

The learning objectives include:

- This course will help students to learn techniques and approaches of SQC being used in industry to manufacture goods and services of high quality at low cost.
- This course will also give exposure to sampling inspection plans.

Learning Outcomes:

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

- Comprehend the concept of Statistical Quality Control and its application in Industry.
- Apply Statistical process control tools- Control charts for variables, and attributes.
- Analyse different patterns of variation on Control charts
- Apply statistical product control tools- Sampling inspection plans.

SYLLABUS OF DSC-6

Theory

UNIT I: **(9 hours)**

Basics of Quality

Definition, dimensions of quality, its concept, application, and importance. Introduction to Process and Product Control. Statistical Process Control - Seven tools of SPC, Chance and Assignable Causes of quality variation.

UNIT II: **(21 hours)**

Statistical Control Charts

Construction and Statistical basis of 3-σ Control charts, Control charts for variables: $\underline{X}$& R-chart, $\underline{X}$ & s-chart. chart (for known and unknown parameters) Control charts for attributes: