



**Deccan Education Society's
FERGUSSON COLLEGE (AUTONOMOUS),
PUNE**

**Syllabus
for**

T. Y. B. A. (Applied Statistics)

[Pattern 2019]

(B.A. Semester-V and VI)

From Academic Year
2021-22

Programme Structure

Applied Statistics Sem V

Semester	Paper No.	Course Code	Title	Credits	CE max marks	ESE max marks	Total max marks
V	CC	STA3501	Testing of Hypotheses (General)	3	50	50	100

Applied Statistics Sem VI

Semester	Paper No.	Course Code	Title	Credits	CE max marks	ESE max marks	Total max marks
VI	CC	STA3601	Sampling Theory (General)	3	50	50	100

T. Y. B.A. Semester V

Title of the Course and Course Code	Testing of Hypotheses (General) – STA3501	Number of Credits : 03
Course Outcomes (COs) On completion of the course, the students will be able to:		
CO1	Define the basic terms related to introduction of testing of Hypothesis.	
CO2	Demonstrate the various situations for testing using exact tests. The large sample tests and small sample tests are also demonstrated.	
CO3	Apply the tests for real life problems and discuss the conclusions.	
CO4	Examine the suitability of the tests to be applied and inference to be drawn.	
CO5	Evaluate Probability of type I error, power of the test. And p value.	
CO6	Develop the concept of analysis of variance techniques.	

Unit No.	Title of Unit and Contents	No. of Lecturers
I	<p>Tests of significance Notion of a statistic as a function $T(X_1, X_2, X_n)$ and its illustrations, Sampling distribution of $T(X_1, X_2, \dots, X_n)$. Notion of standard error of a statistic, Notion of hypothesis, critical region, level of significance. Tests based on normal distribution for.</p> <p>(i) $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0, \mu < \mu_0, \mu > \mu_0$ (ii) $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 \neq \mu_2, \mu_1 < \mu_2, \mu_1 > \mu_2$ (iii) $H_0: P = P_0$ against $H_1: P \neq P_0, P < P_0, P > P_0$ (iv) $H_0: P_1 = P_2$ against $H_1: P_1 \neq P_2, P_1 < P_2, P_1 > P_2$</p>	18
II	<p>Tests based on t, chi-square and F distributions t tests for</p> <p>(i) $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0, \mu < \mu_0, \mu > \mu_0$ (ii) $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 \neq \mu_2, \mu_1 < \mu_2, \mu_1 > \mu_2$ (iii) Paired observations, Tests for $H_0: \sigma^2 = \sigma_0^2$ against $H_1: \sigma^2 \neq \sigma_0^2, \sigma^2 > \sigma_0^2, \sigma^2 < \sigma_0^2$, Chi square test for independence of attributes: Chi square test for independence of $r \times s$ contingency- table (without proof). Yate's correction not expected, Tests for $H_0: \sigma_1^2 = \sigma_2^2$ against $H_1: \sigma_1^2 \neq \sigma_2^2, \sigma_1^2 < \sigma_2^2, \sigma_1^2 > \sigma_2^2$</p>	18

III	Analysis of variance techniques Concept of analysis of variance, One-way and two – way classification: break up of total sum of squares, analysis of variance table, test of hypotheses of (i) equality of several means, (ii) equality of two means, Numerical problems.	4
IV	Non - parametric tests Distinction between a parametric and non-parametric problem, Concept of distribution free statistic, One tailed and two tailed test procedure of (a)Sign test, (b) Wilcoxon's signed rank test, run test.	8

References:

1. Goon, Gupta and Dasgupta (1968): Fundamentals of Statistics, Vol. I, The World Press Pvt.Ltd., Calcutta.
2. Gupta, S. P. (2014): Statistical Methods, Sultan Chand and Son Delhi.
3. Gupta S.C., and Kapoor V.K. (1994: Fundamentals of Applied Statistics Sultan Chand & Sons, Delhi.
4. Hoel, P. G. (1965): Introduction. of Mathematical Statistics, John Wiley and Sons Co. New York.
5. Larson H.J. (1982): Introduction to Probability Theory and Statistical Applications, A Wiley International Edition.
6. Meyer, P. L. (1970): Introductory Probability Theory and Statistical Applications, Addison-Wesley Publishing Company.
7. Walpole, R.E. (1982): Introduction to Statistics, Macmillan Publishing Co. New York

T. Y. B.A. Semester VI		
Title of the Course and Course Code	Sampling Theory General Paper 1 (STA3601)	Number of Credits : 03
Course Outcomes (COs) On completion of the course, the students will be able to:		
CO1	Recall concepts of sample, population and various types of simple random sampling methods	
CO2	Explain need of stratification and making clusters and allocation problems in stratified random sampling.	
CO3	Choose a sample of suitable size by using various sampling methods to collect data in day today life and Calculate estimates of unbiased estimators and their standard errors in various sampling methods.	
CO4	Distinguish between cluster random sampling and stratified random sampling	
CO5	Compare simple random sampling, stratified random sampling and systematic sampling and Classify sampling and non-sampling error	
CO6	Design questionnaire and plan sample surveys to collect data.	

Unit No.	Title of Unit and Contents	No. of Lecturers
I	<p>Sampling Concept of distinguishable elementary units, sampling units, sampling frame, random sample, requisites of a good sample. Simple random sampling from finite population of size N (i) with replacement (SRSWR) ii) without replacement (SRSWOR) definitions, population mean and population total as parameters, inclusion probabilities, a) Sample mean \bar{y} as an estimator of population mean, expression for expectation and standard error of \bar{y}, confidence interval for population mean, population total, (b) $N\bar{y}$ as an estimator of population total, expression for expectation and standard error of N, (c) Estimator of above standard errors, both in case of SRSWR and SRSWOR, Sampling for proportion as an application of a simple random sampling with X_i as zero or one, a sample proportion as an estimator of population proportion of units possessing a certain attribute expression for expectation and standard error of estimator (p). (b) Np as an estimator of total number of units in the, Np as an estimator of total number of units in the population possessing a certain attribute, expression for expectation and standard error of estimator Np (c) Estimator of above standard error both in case of SRSWR and SRSWOR</p>	10
II	<p>Determination of Sample Size: Determination of the sample size for the given: i) Margin of error and confidence coefficient. Coefficient of variation of the estimator and confidence coefficient</p>	5
III	<p>Stratified Random Sample Size Stratification, basis of stratification, real life situation where stratification can be used Stratified random sampling as a sample drawn from individual strata using SRSWOR in each stratum. (a) $\bar{y}_{st} = \frac{\sum N_i \bar{y}_i}{N}$ as an estimator of population mean (\bar{Y}) expression for expectation and standard error of \bar{y}_{st}. (b) $N \bar{y}_{st}$. as an estimator of population total, expression for expectation and standard error of $N \bar{y}_{st}$. (c) Estimator of above standard errors, Problem of allocation, proportional allocation, Nyman's allocation, the expressions for the standard errors of the above</p>	12
IV	<p>Ratio and Regression Methods of Estimation for SRSWOR Rationale behind using auxiliary variates in estimation, Situations where (i) ratio method is appropriate, (ii) regression</p>	8

	method is appropriate, Ratio and regression estimators of the population mean and population total standard error of these estimators.	
V	Systematic Sampling (Population size divisible by sample size) Real life situations where systematic sampling is appropriate. Techniques of drawing a sample using systematic sampling, Estimation of the population mean and population total,	5
VI	Role of Sample Surveys in Research Methodology Objectives of a sample survey. Designing a questionnaire, characteristics of a good questionnaire (Questions with codes & scores are to be discussed). Reliability and validity testing by using. (i) Test – Retest method. (ii) Internal Consistency: (A) Kuder Richardson Coefficient (KR-20) Cronbach's Coefficient Alpha, Planning, execution and analysis of a sample survey, practical problems at each of these stages, Sampling and non-sampling errors with illustrations, Study of some surveys illustrating the above ideas, rounds conducted by National Sample Surveys organization	8

References:

1. Cochran, W.G. (1977) Sampling Techniques, third Edition Wiley Eastern Ltd., New Delhi.
2. Malhotra N. (2008). Marketing Research and Applied Orientation (third edition), Prentice Hall of India. New Delhi.
3. Mukhopadhyay P (2008). Sampling theory and methods of survey sampling. Prentice-Hall of India, New Delhi.
4. Murthy, M. N. (1967). Sampling methods, Indian Statistical Institute, Kolkata.
5. Singh, D. and Chaudhary, F. S. (1986). Theory and Analysis of Sample Survey Designs, Wiley Eastern Ltd., New Delhi.
6. Sukhatme, P.V., Sukhatme, B. V. (1984). Sampling Theory of Surveys with Applications, Indian Society of Agricultural Statistics, New Delhi