Deccan Education Society's

FERGUSSON COLLEGE, PUNE

(AUTONOMOUS)

SYLLABUS UNDER AUTONOMY

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

SEMESTER - V

Academic Year 2018-2019

T. Y. B. A. (Applied Statistics) Semester - V

Applied Statistics (STA3501)

Testing of Hypotheses (General)

[Credits-3]

Applied Statistics can be offered only as a General level subject.

The main objective of this course is to introduce students to

1. Tests of significance.
2. ANOVA
3. Nonparametric test procedures.

Unit I		**Tests of significance**	**(18L)**
	1.1	Notion of a statistic as a function $T(X_1, X_2, ..., X_n)$ and its illustrations.	
	1.2	Sampling distribution of $T(X_1, X_2, ..., X_n)$. Notion of standard error of a statistic.	
	1.3	Notion of hypothesis, critical region, level of significance.	
	1.4	Tests based on normal distribution for (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 $H_1 : \mu_1 \neq \mu_1$, $\mu_1 < \mu_2$, $\mu_1 > \mu_2$ (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 $H_1 : P_1 \neq P_2$, $P_1 < P_2$, $P_1 > P_2$	
Unit II		**Tests based on t, chi-square and F distributions**	**(18L)**
	2.1	t tests for (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 $H_1 : \mu_1 \neq \mu_1$, $\mu_1 < \mu_2$, , $\mu_1 > \mu_2$ (iii) Paired observations	
	2.2	Tests for $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 \neq \sigma_0^2$, $\sigma^2 > \sigma o^2$, $\sigma^2 > \sigma_0^2$	
	2.3	Chi square test for independence of attributes: Chi square test for independence of r x s contingency- table (without proof). Yate's correction not expected.	
	2.4	Tests for $H_0 : \sigma_1^2 = \sigma_2^2$ against $H_1 : \sigma_1^2 \neq \sigma_2^2$, $\sigma_1^2 < \sigma_2^2$, $\sigma_1^2 > \sigma_2^2$	
Unit III		**Analysis of variance techniques**	**(4L)**
	3.1	Concept of analysis of variance.	
	3.2	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	

	3.3	Numerical problems.	
Unit IV		**Non - parametric tests**.	**(8L)**
	4.1	Distinction between a parametric and non-parametric problem.	
	4.2	Concept of distribution free statistic.	
	4.3	One tailed and two tailed test procedure of (a) Sign test, (b) Wilcoxon's signed rank test, run test, kriskal Wall is test.	
		References: 1.Goon, Gupta and Dasgupta (1968): Fundamental's of Statistics, Vol. I, The World Press Pvt.Ltd. Calcutta. 2. Gupta, S. P.(2014) : Statistical Methods, Sultan Chand and Sons, Delhi. 3.GuptaS.C., and Kapoor V.K.(1994) : Fundamental s 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	

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SYLLABUS UNDER AUTONOMY

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

SEMESTER - VI

Academic Year 2018-2019

T. Y. B. A. (Applied Statistics) Semester - VI

Applied Statistics (STA3601)

Sampling Theory (General)

[Credits-3]

Applied Statistics can be offered only as a General level subject.

The main objective of this course is to introduce students to

1. Concept of sampling
2. Different methods of sampling
3. Objectives of a sample survey

Unit I		**Sampling**	**(10L)**
	1.1	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.	
	1.2	(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 $N\bar{y}$. (c)Estimator of above standard errors, both in case of SRSWR and SRSWOR.	
	1.3	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 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.	
Unit II		**Determination of Sample Size**	**(5L)**
	2.1	Determination of the sample size for the given: i) Margin of error and confidence coefficient. ii) Coefficient of variation of the estimator and confidence coefficient.	

Unit III		**Stratified Random Sample Size**	**(12L)**
	3.1	Stratification, basis of stratification, real life situation where stratification can be used.	
	3.2	Stratified random sampling as a sample drawn from individual strata using SRSWOR in each stratum.	
	3.3	(a) $\overline{y_{st}} = \frac{\sum N_i \overline{y_i}}{N}$ as an estimator of population mean ($\overline{Y}$) expression for expectation and standard error of $\overline{y}_{st}$. (b) N $\overline{y}_{st}$. as an estimator of population total, expression for expectation and standard error of N $\overline{y}_{st}$. (c) Estimator of above standard errors.	
	3.4	Problem of allocation, proportional allocation, Neyman's allocation, the expressions for the standard errors of the above estimators when these allocations are used.	
	3.5	Gain in precision due to stratification, comparison amongst SRSWOR, stratification with proportional allocation and stratification with Neyman's allocation.	
Unit IV		**Ratio and Regression Methods of Estimation for SRSWOR**	**(8L)**
	4.1	Rationale behind using auxiliary variates in estimation	
	4.2	Situations where (i) ratio method is appropriate, (ii) regression method is appropriate	
	4.3	Ratio and regression estimators of the population mean and population total	
Unit V		**Systematic Sampling (Population size divisible by sample size)**	**(5L)**
	5.1	Real life situations where systematic sampling is appropriate. Techniques of drawing a sample using systematic sampling.	
	5.2	Estimation of the population mean and population total, standard error of these estimators.	
Unit VI		**Role of Sample Surveys in Research Methodology**	**(8L)**
	6.1	Objectives of a sample survey	
	6.2	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) KuderRechardson Coefficient (KR-20) (B) Cronbach's Coefficient Alpha	
	6.3	Planning, execution and analysis of a sample survey, practical problems at each of these stages	
	6.4	Sampling and non-sampling errors with illustrations	
	6.5	Study of some surveys illustrating the above ideas, rounds conducted by National Sample Surveys organization	
		References: 1. Cochran, W.G.(1977) Sampling Techniques, third EditionWiley 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.	

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