

Semester	SIX
Course	Major
Paper Code	C3ST230631T
Paper Title	Introduction to Survey Sampling & Design of Experiments
No. of Credits	4
Theory / Practical /Composite	Theory
Classes per week	Module I: 2 classes/week Module II: 2 classes/week
Module	2

Course Outcomes for Module I

1. Remember the basic concepts of population, sample, sampling frame, and sampling units used in survey sampling.
2. Understand the principles of probability sampling and sources of sampling and non-sampling errors.
3. Apply simple random, stratified, and systematic sampling methods to practical survey problems.
4. Analyze the properties of estimators such as unbiasedness, variance, and efficiency under different sampling designs.
5. Evaluate the relative merits and limitations of different sampling schemes for given survey objectives.
6. Create appropriate sampling designs and estimators for real-world survey situations.

Course Outcomes for Module II

1. Remember the fundamental principles of experimental design such as randomization, replication, local control, and factorial concepts.
2. Understand the structure and assumptions of basic experimental designs including CRD, RBD, LSD, and factorial experiments.
3. Apply appropriate experimental designs, including single-factor and factorial experiments, to real-life experimental situations.
4. Analyze data arising from factorial experiments to study main effects and interaction effects using ANOVA.
5. Evaluate the efficiency and suitability of non-factorial designs under practical and resource constraints.
6. Create complete experimental layouts and statistical models for factorial experiments to investigate interaction among factors.

Syllabus

Unit/Module	Content	No. of lectures	CO mapping	Cognitive levels
Module I				
Unit 1	Introductory Concepts: Population and sample, complete enumeration versus sampling, sampling frame, target population and population sampled. Basic principles of sample survey. Types of sampling: non-probability and probability sampling, sampling design and sampling scheme. Inclusion probabilities. Requirement of a good estimator. Sampling and non-sampling errors.	6	CO1 CO2 CO6	K1 K2 K6
Unit 2	Simple random sampling (SRS) with and without replacement: Definition and procedure of selecting a sample, estimates of population mean, total and proportion, variances of these estimates, estimates of their variances and sample size determination.	12	CO3 CO4 CO5 CO6	K3 K4 K5 K6
Unit 3	Stratified random sampling: Technique, estimates of population mean and total, variances of these estimates. Principle of stratification. Proportional and optimum allocations and their comparison with SRS. Practical difficulties in allocation.	8	CO3 CO4 CO5 CO6	K3 K4 K5 K6
Module II				
Unit 1	Experimental designs: Introduction and historical perspective. Experimental error. Basic principles of design. Uniformity trials, fertility contour maps, choice of size and shape of plots and blocks.	3	CO1 CO2	K1 K2
Unit 2	Basic designs: Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD) – Layout, model and analysis. Relative efficiencies. Analysis with one missing observation in RBD and LSD.	15	CO2 CO3 CO5	K2 K3 K5

Unit 3	Factorial experiments & Confounding: Advantage of factorial experiment over single factor experiments. Concept of 2n factorial experiments, related design and analysis. Total and Partial confounding for 2n factorial experiments.	8	CO1 CO2 CO3 CO4 CO6	K1 K2 K3 K4 K6
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Reading/Reference list

1. Cochran, W.G. (1984): Sampling Techniques (3rd Ed.), Wiley Eastern
2. Sukhatme, P.V., Sukhatme, B.V. Sukhatme, S. Asok, C. (1984). Sampling Theories of Survey with Application, IOWA State University Press and Indian Society of Agricultural Statistics.
3. Murthy, M.N. (1977): Sampling Theory & Statistical Methods, Statistical Pub. Society, Calcutta.
4. Des Raj and Chandhok P. (1998): Sample Survey Theory, Narosa Publishing House.
5. Goon A.M., Gupta M.K. and Dasgupta B. (2008): Fundamentals of Statistics, Vol-II, World Press
6. Introduction to Sampling Theory Swayam Prabha Course.
7. Mukhopadhyay, P. (2005): Applied Statistics. 2nd edition, Books and Allied Pvt Ltd.
8. Cochran, W.G. and Cox, G.M. (1959): Experimental Design. Asia Publishing House
9. Dey, A. (1986) : Theory of Block Designs, Wiley Eastern Limited
10. Montgomery, D. C. (2008): Design and Analysis of Experiments, John Wiley.
11. Das, M.N. and Giri, N. C. (1986): Design and Analysis of Experiments. Wiley Eastern Ltd.

Evaluation

	CIA: 30			
	Semester Exam: 70			
	Total: 100			
Paper Structure for Theory Semester Exam	Module-I (35 marks)		Module-II (35 marks)	
	5 marks Questions	15 marks Questions	5 marks Questions	15 marks Questions
	4 out of 6	1 out of 2	4 out of 6	1 out of 2

CO	CO Description for Module I	Cognitive levels
CO1	Remember the basic concepts of population, sample, sampling frame, and sampling units used in survey sampling.	K1

CO2	Understand the principles of probability sampling and sources of sampling and non-sampling errors.	K2
CO3	Apply simple random, stratified, and systematic sampling methods to practical survey problems.	K3
CO4	Analyze the properties of estimators such as unbiasedness, variance, and efficiency under different sampling designs.	K4
CO5	Evaluate the relative merits and limitations of different sampling schemes for given survey objectives.	K5
CO6	Create appropriate sampling designs and estimators for real-world survey situations.	K6

CO	CO Description for Module II	Cognitive levels
CO1	Remember the fundamental principles of experimental design such as randomization, replication, local control, and factorial concepts.	K1
CO2	Understand the structure and assumptions of basic experimental designs including CRD, RBD, LSD, and factorial experiments.	K2
CO3	Apply appropriate experimental designs, including single-factor and factorial experiments, to real-life experimental situations.	K3
CO4	Analyze data arising from factorial experiments to study main effects and interaction effects using ANOVA.	K4
CO5	Evaluate the efficiency and suitability of non-factorial designs under practical and resource constraints.	K5
CO6	Create complete experimental layouts and statistical models for factorial experiments to investigate interaction among factors.	K6