

Discipline-Specific Elective (DSE) Course 3f: Advanced Survey Sampling

Structure 1: PG Curricular Structure with only Course Work
 Structure 2: PG Curricular Structure with Course Work + Research
 Structure 3: PG Curricular Structure with Research only

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Prerequisite of the course (if any)
		Lecture (45 Hours)	Tutorial (15 Hours)	Practical (00 Hours)		
DSE 3f: Advanced Survey Sampling	4	3	1	0	NIL	Basic knowledge of Survey Sampling

Course Objectives:

- To provide advanced techniques in survey sampling with practical applications in daily life.
- To provide accessible statistical tools for applying sampling strategies and methodologies.

Course Learning Outcomes: Upon successful completion of this course, students will be able to:

- Understand the non-existence of uniform estimators and repetitive surveys.
- Apply the re-sampling techniques for variance estimation independent and dependent random groups.
- Understand the design-based estimation procedures and double sampling technique for stratification.
- Understand the response and non-response techniques; Randomized Response Technique and a technique to predict non-observed residue under design and model-based model.
- Understand the model assisted sampling strategies; super population model.

Unit I (12 Hours)

Admissibility of Estimators; Non-existence of UMV estimators; Estimation of Median; Sampling on two or more successive occasions (Repetitive surveys); Double sampling for stratification; Re-sampling techniques for variance estimation-independent and dependent random groups, the Jackknife and the Bootstrap.

Unit II (12 Hours)

Small-area estimation; Design-based conditional approach; Direct and Indirect Estimators; Fay-Herriot Model. Ranked set sampling (RSS); RSS in parametric and non-parametric estimation; various versions of RSS. Adaptive Cluster Sampling (ACS); ACS based on order statistics.

Unit III (11 Hours)

Non-sampling errors; non-response and missing data; Randomized Response Techniques for one quantitative sensitive characteristic. Prediction of non-observed residual under fixed (design-based) and super-population (model-based) approaches.

Unit IV (10 Hours)

Model-assisted sampling strategies; Different types of Super-population models with optimal strategies based on them.

Tutorial:

Tutorial sessions will include at least one activity such as group discussion/presentation/ problem solving exercise based on the material covered in the lectures along with scholastic work related to the conceptual understanding of the subject.

Essential Readings:

1. Cassel, C.M., Sarndal, C.E. and Wretman, J.H. (1977). *Foundations of Inference in Survey Sampling*, John Wiley & Sons.
2. Chaudhuri, A. and Mukerjee, R. (1988). *Randomized Response: Theory and Techniques*, Marcel Dekker Inc.
3. Hedayat, A.S. and Sinha, B.K. (1991). *Design and Inference in Finite Population Sampling*, John Wiley & Sons.
4. Rao, J.N.K. and Molina, I. (2015). *Small area estimation*, John Wiley & Sons.
5. Sarndal, C.E., Swensson, B. and Wretman, J.H. (1992). *Model Assisted Survey Sampling*, Springer.

Suggested Readings:

1. Chaudhari, A. and Stenger, H. (2005). *Survey sampling Theory and Methods*, Chapman and Hall.
2. Latpate, R., Kshirsagar, J., Gupta, V.K. and Chandra, G. (2020). *Advanced Sampling Methods*. Springer.
3. Levy, P.S. and Lemeshow, S. (2008). *Sampling of Populations: Methods and Applications*, John Wiley & Sons.

4. Muhopadhyay, P. (2009). *Survey Sampling*, Narosa Publishing House.
5. Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Asok, C. (1984). *Sampling Theory of Surveys with Applications*, Iowa State University Press.
6. Wolter, K.M. (2007). *Introduction to Variance Estimation*, Springer.
7. Wu, C. and Thompson, M.E. (2019). *Sampling theory and practice*. Springer.