



**NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ECONOMICS AND STATISTICAL ENGINEERING**

STATISTICAL ENGINEERING PROGRAM

ES611 – SAMPLING II

I. GENERAL INFORMATION

CODE	:	ES611 Sampling II
SEMESTER	:	6
CREDITS	:	4
HOURS PER WEEK	:	5 (3 Theory – 2 Practice)
PREREQUISITES	:	ES412 Sampling I
CONDITION	:	Mandatory

II. COURSE OUTCOMES

To know, develop and apply the theory of the diverse techniques of sampling, that allow to design a sample to know the characteristics of a determined population.

III. LEARNING UNITS

CHAPTER I

Conglomerate Sampling. Description and definition. Design effect and optimum sample size. Conglomerate of different size.

CHAPTER II

Staging Sampling. Definitions. Sampling with under - sampling. Theorem of Madow. Estimators and Variances. Optimization, costs and sample size in the two-stage sampling. A numerical example of simple optimization. Estimation of variances. Primary units of different size, selection with equal probabilities and simple subsampling. Generalization to stratified sampling.

CHAPTER III

Sampling with unequal probabilities. Sampling with replenishment and unequal probabilities: hope and variance of Hansen Hurwitz estimator. Untested variance estimator. Selection with probabilities proportional to size (PPT) in sampling with or without replacement. Variance and its estimation in the case of selection with PPT with replacement. Extension to the multistage sampling: selection PPT with primary units replacement and without replacement in the remaining stages. Variance of the estimator. Estimation of variance. Sampling without replacement and unequal probabilities, hope and variance of the Horvitz and Thompson estimator. Untested variance estimator. Selection without replacement and probabilities proportional to sizes. Extension to multistage sampling: selection without replenishment in all stages. Sampling with gradually varying probabilities.

Maintenance of probabilities is selected in the sampling. Extension to the two-stage sampling. Comparison of methods. Variances of a linear estimator. Durbin's theorems. Other procedures for estimation of variances.

CHAPTER IV

Complementary topics. Interpenetrating subsamples. Estimation of means and totals in subpopulations. Randomized response model. Selection of the number of re-interviews.

IV. BIBLIOGRAPHY

- **Abad - Servin.** Introduction to sampling.
- **Mendenhall, William.** Sampling elements.
- **Cochran, V.G.** Sampling techniques.
- **Desraj.** Theory of sampling.
- **Azorin, Francisco and Sanchez Crespo, Jose.** Methods and applications of sampling.
- **Perez Lopez Cesar.** Statistical Sampling.