NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ECONOMICS AND STATISTICAL ENGINEERING

STATISTICAL ENGINEERING PROGRAM

ES612 – LINEAR MODELING

I. GENERAL INFORMATION

CODE	:	ES612 Linear Modeling
SEMESTER	:	6
CREDITS	:	4
HOURS PER WEEK	:	5 (3 Theory – 2 Practice)
PREREQUISITES	:	ES512 – EC418
CONDITION	:	Mandatory

II. COURSE DESCRIPTION

Theoretical course oriented to the development of linear statistical models that will allow the student to access the study of technical courses of specialty of the professional career of statistics such as: linear regression analysis, multivariate analysis I, multivariate analysis II, experimental designs among others.

III. COURSE OUTCOMES

1. To emphasize the importance of the normal multivariate distribution in linear statistical modeling.
2. To emphasize the importance of the statistical analysis of the quadratic forms in the process of linear inference.
3. To motivate the student to study the theoretical foundations of linear statistical modeling showing its practical usefulness in the application field.

IV. LEARNING UNITS

INTRODUCTION
Introduction. Importance of the course. Methodology. The course and contribution to the professional profile. Linear models. Classification. Nonlinear models.

MULTIVARIATE NORMAL DISTRIBUTION
Formulation and overview of linear models. Random vectors and matrices. Population and sampling moments with random vectors and matrices. Product Kronecker, operator vec (), etc. Multivariate Normal Distribution, Properties. Population and sample moments of the normal multivariate distribution. Estimation of μ and ∑.

ANALYSIS OF QUADRATIC FORMS
Distribution of quadratic forms, independence and hope. Normal matrix and its distribution.

Theorems of distribution and independence. Multivariate sampling. Distribution X2 non-central and F non-central.

GENERAL LINEAR MODEL

Full range linear model. Point estimate. Gaussian model. Ordinary Least Squares (OLS). Classic Linear Model. Introduction to the statistical test F snedecor.
Tests of global significance. Individual Test. Proof of partial significance. Residual focus. Hypothesis testing. General linear hypothesis (Wald test). Proof of likelihood ratio. Estimation under restrictions.

REGRESSION MODEL

Regression Model. Definition. Simple, partial and multiple correlation. Regression and conditional distribution of the multivariate normal.
Analysis of variance (ANVA). Analysis of the quadratic forms of sources of variation. Null hypothesis. Bhatt's motto.

LINEAR MODEL OF INCOMPLETE RANGE

Introduction to Incomplete Range models. Models of unstructured experimental design. Model with replicas.
Variance analysis. Sources of variation and analysis of their quadratic forms.

FACTORIAL MODEL

Formulation of the factorial model in one sense. Estimate. Variance analysis. Sources of variation and their quadratic forms.
Formulation of the factorial model in two senses. Estimate. Variance analysis. Sources of variation and statistical analysis of their quadratic forms.
Analysis of variance with interaction. Proof of hypotheses with interaction. Sources of variation and statistical analysis of their quadratic forms.

V. METHODOLOGY

The theoretical content of the course requires the student to be permanently evaluated in the management of statistical-mathematical models through a written partial, final and qualified examination. The course combines the master class with the use of tutorials from a virtual platform.

VI. GRADING SYSTEM

System “I”
Mid-term Exam (Weight 1)
Final Exam (Weight 1)
Average of qualified practices (Weight 2)

VII. BIBLIOGRAPHY

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