NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ECONOMICS AND STATISTICAL ENGINEERING

STATISTICAL ENGINEERING PROGRAM

ES811 – MULTIVARIANT ANALYSIS I

I. GENERAL INFORMATION

CODE	: ES811 Multivariant analysis I
SEMESTER	: 8
CREDITS	: 4
HOURS PER WEEK	: 5 (Theory 3, Practice 2)
PREREQUISITES	: ES712 Regression analysis
CONDITION	: Mandatory

II. COURSE INTRODUCTION

Theoretical course oriented to the development of linear statistical models that will allow the student to study social phenomena and engineering in their multivariate nature. The corresponding base models are developed: exploratory analysis of multivariate data, sample geometry, distributions and multivariate inference, multiple multivariate linear regression and MANOVA. Unlike the traditional sequence, the course includes the main components technique immediately after the exploratory analysis of data in order that the student reinforces, from the applications with the mentioned technique, the key concepts of the sample geometry and the Graphical analysis.

III. COURSE OUTCOMES

1. Formulate and analyze practical problems in the context of multivariate statistical models which implies understanding the multivariate nature of the phenomena under study.

2. Acquire sufficient knowledge to use correctly and constructively the computer tool and the appropriate statistical software.

3. Common sense in the use of the data to support an argument and to foment the critical reasoning based on the valuation of the objective evidence.

IV. CONTENIDO Y UNIDADES DIDÁCTICAS CALENDARIZADOS

1. INTRODUCTION

Introduction to Multivariate Analysis. Importance of the course. The research process with multivariate data. Classification of multivariate techniques.

2. **CHAPTER I EXPLORATORY DATA ANALYSIS**

Quantitative Methods. Sample Geometry: Sample Geometry. Random Sample, Expected Sample Mean, and Covariance Matrix. Generalized variance. Expressions of Mean, Covariance, Correlation, and Sample Linear Combinations of Random Variables.

Graphical Methods: Analysis of Distribution, relation and difference. Multivariate Profiles. Verification of Multivariate Analysis Assumptions.

3. **CHAPTER II INTRODUCTION TO FACTORIAL METHODS**

Introduction. Amount of Information. Distances. Transformation Main Components (ACP). Ratio and Analysis between the Spaces Rp and Rn. Choice of Number of Axes: own values and method of arcs. Interpretation of Factors. Interpretation of the Cloud of Individuals. Duality of spaces. Transition relationships.

4. **CHAPTER III MULTIVARIATE DISTRIBUTIONS**

Multivariate Normal Density: Properties. Maximum Likelihood Estimate. Distribution of the Sample Mean and S. Behavior of Large Samples. Checking Normality Assumptions. Transformations to Normality. Detection of outliers using main components. Multivariate Sampling. Matrices of normal data. Properties and theorems Independence.

Wishart distribution. Partitioned Wishart. T2 Hotelling statistician. Generalized Distance of Mahalanobis. Hotelling's likelihood ratio and T2 tests. Regions of Confidence of the Media. Simultaneous Comparisons of Media Components. Bonferroni Method for Multiple Components. Inference of a vector of population means for large samples.

5. **CHAPTER IV HYPOTHESIS TEST**

Comparison by Pair. Design of Repeated Stockings to Compare Treatments. Comparison of Vector Stocks of Two Populations. Comparison of Several Multivariate Population Averages.

The multivariate multiple linear regression model. Formulation. Assumptions. Properties.

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. Although the course is theoretical, it includes the presentation of a work related to the exploratory graphical analysis of data. Thus, the student is also expected to develop communicative and collaborative skills aimed at achieving results. The course combines the use of tutorials from a virtual platform, as well as mathematical and statistical packages of general purpose.

VI. GRADING SYSTEM

Evaluating System “I”. Calculating the final average: **PF = (EP + EF + 2PP) / 4**
Four graded practices are applied, the lowest grade is deleted.

EP: Mid-term Exam, EF: Final Exam, PP: Average of qualified practices.

VII. BIBLIOGRAPHY

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Mardia, K.V. Multivariate Analysis. Academic Press. Inc. 1982.

Hair, J. Anderson, R. Tathan, R. Black. Multivariate Analysis. Prentice Hall. 5th edition. 1999.

Murphy, James. "How to Read the Statistical Methods Literature: A Guide for Students". The American Statistician, May 1997, Vol 51, No 2.

SPSS Interactive Graphics 17.0. Marketing Department. SPSS Inc. Chicago. USA. 1999. (User Manual)

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