NATIONAL UNIVERSITY OF ENGINEERING

COLLEGE OF ECONOMICS AND STATISTICAL ENGINEERING

STATISTICAL ENGINEERING PROGRAM

ES712 – REGRESSION ANALYSIS

I. GENERAL INFORMATION

CODE	**:**	ES712 Regression analysis
SEMESTER	**:**	7
CREDITS	**:**	3
HOURS PER WEEK	**:**	7 (2 Theory – 3 Practice – 2 Laboratory)
PREREQUISITES	**:**	ES612 Linear Modeling
CONDITION	:	Mandatory

II. COURSE DESCRIPTION

At the end of the course, the student will be able to apply the regression analysis to estimate a model that allows an appropriate explanation of the behavior of the variable of interest. In addition it will be able to make use of the statistical packages SPSS and Minitab in the regression analysis.

III. COURSE OUTCOMES.

At the end of the course the student will be able to:

1. Estimate a regression model, perform the interval estimation process and establish hypothesis tests about its parameters.
2. Carry out the estimation process using weighted regression and polynomial models.
3. Include qualitative predictor variables through the use of indicator variables.
4. Choose the appropriate transformation of the response variable and the predictor variables that allow to fulfill the assumptions of the analysis.
5. Apply the techniques of residual analysis to detect violations of the assumptions of the regression analysis and its remedial measures.
6. Perform Influence analysis to detect influential cases as well as treatment suggestions.
7. Apply the variables selection techniques to obtain the best model.

IV. LEARNING UNITS

- Multiple linear regression model. General case., Non-intersection case (matrix form).
- Parameter estimation. Methods of minimum squares. Method of maximum verisimilitude. Gauss-Markov theorem. Estimation of population variance.
- Estimation by intervals. Coefficient of determination. Decomposition of the sum of squares conditional total.
- Hypothesis hypothesis - General linear hypothesis.
- Method of selection of variables: Consequences of a bad specification.
- Coefficient of determination. Mallows Cp. Prediction Error.
- Sequential procedures: backward, forward, step by step.
- Waste analysis: Types of waste. Ordinary, standardized, studied. Graphic methods.
- Diagnosis of statistical influence. Dfits. Debetas. D of Cook. Autocorrelation: Nature. Effects. Diagnosis. The process approach
- Heteroskedasticity. Nature. Effects. Diagnostics

- Multicollinearity, Autocorrelation: Nature. Effects, Diagnosis.
- Indicator variables in the regression model.
- Nonlinear Regression: Polynomial model: particular case of the multiple regression model. Estimation and number of hypotheses using Orthogonal Polynomials.
- Validation of Multiple Regression Models.
- Non-linear regression models.

V. METHODOLOGY

The development of Syllabus will be carried out through theoretical expositions - teacher practice, in classroom with active participation of students using didactic material, statistical models and computer, using appropriate software in programming.

In this framework the practical application of the elements of the course will reinforce the skills that are sought to achieve with the teaching-learning sessions.

VI. GRADING SYSTEM

Evaluation system: I
Average of qualified practices and / or monographs developed during the semester (weight 2)
Partial Exam (weight 1)
Final Exam (weight 1)

VII. BIBLIOGRAPHY

1. DRAPER, N. y SMITH H
   Applied regression analysis. Second Edition. Wiley 1981
2. MONTGOMERY D. PECK E.
   Introduction to linear regression analysis. Wiley
3. SEBER, G.A.F.
   Linear regression analysis. J. Wiley 1977
4. WEISBERG, S.: *Applied linear regression*. J. Wiley, 1980.
5. PEÑA, DANIEL. Regression and Design of Experiments. Alianza Editorial, 2002.