Competences and Skills That Will Be Acquired and Learning Results.

The aim of the course is to review, at an intermediate level, the basic concepts and methods of Linear Regression. Emphasis is both in theory and applications.

Description of Contents: Programme

1. Introduction.
   **1.1 Formulation and meaning of a statistical regression problem.
   **1.2 Regression models. Goals of a regression analysis.
   **1.3 Data in a regression analysis.
   **1.4 Regression software.

2. The Multiple Linear Regression Model: Estimation.
   **2.1 Definition and matrix expression.
   **2.2 Least squares estimation.
   **2.3 Analysis of variance.

Appendix:
   **A.1 The multivariate normal distribution.

3. The Multiple Linear Regression Model: Hypothesis Testing and Confidence Regions.
   **3.1 The F-test for the general linear hypothesis.
   **3.2 Confidence regions.
   **3.3 Prediction intervals.

Appendix:
   **A.1 Indicator variables.

   **4.1 Multicollinearity: description and consequences.
   **4.2 Residual analysis.
   **4.3 Outliers and extreme cases.

5. Generalized Least Squares Theory.
   **5.1 Cases of known and unknown covariance matrix.
   **5.2 Heteroscedasticity.
   **5.3 Transformations.
   **5.4 Serial correlation.

6. Time Series Models
**6.1 Autoregressive (AR) and moving average (MA) models.**
**6.2 ARMA and ARIMA models.**

**LEARNING ACTIVITIES AND METHODOLOGY**
There will be computer classes, in which the statistical package R will be used with the purpose of illustrating the derivations of the theoretical classes.

**ASSESSMENT SYSTEM**
Written exam (50%) and Practice Workbook (50%) in both the ordinary and extraordinary exams.

- **% end-of-term-examination:** 50
- **% of continuous assessment (assignments, laboratory, practicals...):** 50

**BASIC BIBLIOGRAPHY**

**ADDITIONAL BIBLIOGRAPHY**
- BROCKWELL P. J. and DAVIS, R. A. Introduction to Time Series and Forecasting, 3rd Edn., Springer Verlag, 2016
- JAMES, G., WITTEN, D., HASTIE, T. y TIBSHIRANI, R. An Introduction to Statistical Learning with Applications in R, Springer Verlag, 2013