ESIROI
ÉCOLE D'INGÉNIEURS
UNIVERSITÉ DE LA RÉUNION

DEPARTMENT : *BE*
SEMESTER : *S5*

IDENTIFICATION

Course code : E3BE5QE3
ECTS : 1

DURATION

Lectures :	4
Tutorial classes :	12
Labs :	0
Total :	16

Project :
Personnal work :

ASSESSMENT

Minimum 2 continuous assessments.

TEACHING MATERIALS

Handout, Moodle

LANGUAGE

English

CONTACT

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Modifié le : 3 août 2026

UE : UE5.2-QEB

COURSE : Data Processing

SCOPE OF THE COURSE

OBJECTIVES

This course aims to equip student-engineers with the knowledge required to design experimental campaigns and analyze their results. They will be able to identify key factors and highlight main trends, while providing their results with information on the inherent uncertainty of this analysis.

COMPETENCE AND SKILLS

Build a linear or nonlinear model to explain and predict the variability of the endogenous variable.
Represent, analyze, and interpret the complexity of a large dataset using a simple one-dimensional or two-dimensional structure, i.e., identify what is analogous on the right side of the origin, on the left side, and concisely and accurately express the contrast between the two extremes.
Build a typology according to an ordered hierarchy and measure its quality.
Be able to conduct these analyses using specialized numerical tools : R, for example.

PROGRAM

— Multiple linear regression. Motivation. Examples. Descriptive approach. Affine dependence. Total, explained, and residual sum of squares. Multiple and simple regression coefficients. Probabilistic approach. Linear model. Estimation of regression coefficients and model standard deviation. Confidence intervals for coefficients. Global and marginal tests of coefficient nullity. Examples.

— Introduction to experimental design. Full factorial design. Example. Responses. Factors. Levels. Main effects and interaction effects. Representation. Iso-response curves. Response surfaces. Link with multiple regression.

— Principal Component Analysis. Review of vector analysis and matrix reduction. Motivation. Examples. Data tables. Fitting and analysis in the individuals' cloud. Inertia or variance explained by an affine subspace. Covariance matrix. Main diagonalization theorem. Interpretation. Fitting and analysis in the variables' cloud. Examples.

— Hierarchical ascending classification. Motivation. Typology and distance. Examples. General algorithm for hierarchical ascending classification. Dendrogram. Simple examples. Hierarchical ascending classification using Ward's variance criterion. Total variance, inter-class variance, intra-class variance. Quality of a typology. Examples.

BIBLIOGRAPHY

Husson, François, Sébastien Lê, and Jérôme Pagès. *Analyse de données avec R*. Presses universitaires de Rennes, 2016.

Goupy, Jacques. *Introduction aux plans d'expériences*. Dunod, 2017.

REQUIREMENTS