



## STATISTIQUE APPLIQUÉE AUX SCIENCES DE L'INGÉNIEUR

### STATISTICAL ENGINEERING

Lecturers: Céline HARTWEG-HELBERT

| Lecturers : 16.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 12.0 | Project : 0.0 | Language : FR

#### Objectives

The objective of this course is to provide the classic tools of mathematical statistics which includes the choice of the probabilistic model, its estimation and its evaluation. The aim of this course is also to provide training in the manipulation of data and the practical implementation of the studied models. For this, a substantial part of the course is oriented towards the implementation of the different models using the R software through the study of a large number of examples.

**Keywords :** Linear and logistic regression. Model selection. Design of experiments. Statistical analysis of numerical simulations. Bayesian optimization.

#### Programme

- 1) Linear regression. Validities and limitations of the method. Model selection.
- 2) Design of experiments: screening and response surface
- 3) Logistic regression
- 4) Statistical analysis of numerical simulations: Gaussian process regression, designs of computer experiments, sensitivity analysis, Bayesian optimization.

#### PRACTICAL ACTIVITIES

The three activities will be devoted to learning the techniques of regression models on the R software. Numerous data sets will be studied.

#### Learning outcomes

- Know how to recognize different classes of statistical learning problems.
- Know how to implement basic models of statistical learning and validate their relevance.
- Know how to implement a kriging ( Gaussian process regression).
- Know how to use R.

#### Independent study

Objectifs :

Méthodes :

#### Core texts

G. Saporta, *PROBABILITÉS, ANALYSE DES DONNÉES ET STATISTIQUE*, Technip, 2020  
T Hastie, R Tibshirani, J Friedman *THE ELEMENTS OF STATISTICAL LEARNING: DATA MINING, INFERENCE, AND PREDICTION*, Springer, 2009  
TJ Santner, BJ Williams, WI Notz, BJ Williams *THE DESIGN AND ANALYSIS OF COMPUTER EXPERIMENTS*, Springer, 2003

#### Assessment

Final mark = 60% Knowledge + 40% Know-how  
Know-how = 100% continuous assessment  
Knowledge= 100% final exam