# Graduate statistics

**Lecturers**
Davy PAINDAVEINE (Coordinator) and Thomas VERDEBOUT

**Course mnemonic**
STAT-F404

**ECTS credits**
5 credits

**Language(s) of instruction**
English

**Course period**
First term

**Campus**
Plaine

## Course content

In 2026-2027, the course will be taught by Davy Paindaveine (Davy.Paindaveine@ulb.be)

Lectures are given in English so the description of the course (even in the French part) is provided in English.

Conditional expectation/probability, sufficiency, Halmos-Savage theorem, the factorization criterion, minimal sufficiency. Rao-Blackwell theorem, distribution-freeness and ancillarity. Completeness and the Lehmann Scheffé theorem, U-statistics. Exponential families, group equivariance. Uniformly most powerful tests, Neyman-Pearson Lemma, Unbiasedness, similarity, Neyman alpha-structure and invariant tests.

## Objectives (and/or specific learning outcomes)

The course is a general course in Mathematical Statistics that will help the student to tackle statistical problems of many different natures. The results of the course do apply in many diferent topics in statistics such as data analysis, multivariate analysis and regression.

The main objective of the course is to provide methods that allow to take optimal decisions (in estimation or hypothesis testing). We describe different statistical principles and properties and show the optimal solutions exist in certain situations.

At the end of the course, the student will have a critical look at what a statistical problem is and its mathematical foundations.

## Pre-requisits and co-requisits

### Course having this one as pre-requisit

MEMO-F521 | Mémoire | 25 crédits

### Required knowledge and skills

To follow this course, you need to have a background in Mathematical Statistics already (typically form an introductory course in Mathematical Statistics like Mathematical Statistics I at ULB).

## Teaching method and learning activities

The course mainly consists in theoretical lectures. We also use active methods to help the student to understand the course.

### Contribution to the teaching profile

Please see the French part (the teaching profile in in French).

### References, bibliography and recommended reading

Lehmann, E. L., & Casella, G. (1998). *Theory of point estimation* (Vol. 31). Springer Science & Business Media.

Lehmann, E. L., & Romano, J. P. (2006). *Testing statistical hypotheses*. Springer Science & Business Media.

## Other information

### Place(s) of teaching

Plaine

### Contact(s)

Université Libre de Bruxelles (Campus Plaine).

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## Evaluation method(s)

Other, Oral presentation and Project

### Main language(s) of evaluation

English

## Programmes

### Programmes proposing this course at the faculty of Sciences

MA-ACTU | Master in Actuarial Science | finalité Professional/unit 1 and finalité Professional/unit 2, MA-MATH | Master in Mathematics | finalité Research/unit 1 and finalité Research/unit 2

and MA-STAT | Master in Statistics : General | finalité Research General/unit 1

## Programmes proposing this course at the Solvay Brussels School of Economics and Management

MA-ECOE | Master in Economics : Econometrics | finalité Research in Economics/unit 2 and finalité Research in Economics and statistics/unit 1