


 Faculty of Applied Sciences

**INMA2731 Stochastic processes : Estimation and prediction**

[30h+30h exercises] 5 credits

This course is taught in the 2nd semester

**Teacher(s):** Michel Gevers, Luc Vandendorpe  
**Language:** French  
**Level:** Second cycle

### Aims

At the end of this course, the students will be able to :

- Have a good understanding of and familiarity with random variables and stochastic processes ;
- Characterize and use stable processes and their spectral properties;
- Use the major estimators, and characterize their performances ;
- Synthetize predictors, filters and smoothers, in both Wiener or Kalman frameworks.

### Main themes

The object of this course is to lead to a good understanding of stochastic processes, their most commonly used models and their properties, as well as the derivation of some of the most commonly used estimators for such processes : Wiener and Kalman filters, predictors and smoothers.

### Content and teaching methods

The course is subdivided into four parts/chapters:

- Probabilities, random variables, moments, change of variables.
- Stochastic processes, independence, stability, ergodicity, spectral representation, classical models of stochastic processes.
- Estimation (for random variables) : biais, variance, bounds, convergence, asymptotic properties, classical estimators.
- Estimation (for random processes) : filtering, prediction, smoothing, Wiener and Kalman estimators.
- Learning will be based on courses interlaced with practical exercise sessions (exercises done in class or in the computer room using MATLAB). In addition, the training includes a project to be realized by groups of 2 or 3 students.

### Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

- Prerequisite : INMA 2701 Mathématiques appliquées : signaux et systèmes
- Support : course notes, written by the two lecturers, are made available.
- Evaluation method : The evaluation will be based on a written exam made up of a few exercises (with use of the course textbook), and on an interview about the student's project.

### Programmes in which this activity is taught

**INFO2** Ingénieur civil informaticien

**Other credits in programs**

<b>ELEC21</b>	Première année du programme conduisant au grade d'ingénieur (5 credits) civil électricien	Mandatory
<b>ELEC22</b>	Deuxième année du programme conduisant au grade d'ingénieur civil électricien (5 credits)	
<b>INFO22</b>	Deuxième année du programme conduisant au grade d'ingénieur civil informaticien (5 credits)	
<b>MAP21</b>	Première année du programme conduisant au grade d'ingénieur (5 credits) civil en mathématiques appliquées	