Faculty of Applied Sciences

ELEC2875　　SYSTEM IDENTIFICATION

[30h+30h exercises] 5 credits

This course is taught in the 2nd semester

Teacher(s):　　　　Michel Gevers
Language:　　　　　French
Level:　　　　　　Second cycle

Aims

The aim of this course is to enable the students to obtain a mathematical model of a dynamical process on the basis of input-output data measured on this process. Such mathematical model is typically required in order to predict, simulate or control this process. At the end of the course, the students will be able to estimate a mathematical model on the basis of input-output date; this implies estimating the mathematical structure of a model, estimating the parameters within that structure, and validating the model with respect to a pre-defined objective.

Main themes

Identical to the contents of the course

Content and teaching methods

The following material will be covered :
1. Mathematical models viewed as predictors
2. Non-parametric identification methods
3. Estimation of parametric models by Prediction Error Method
4. Frequency domain interpretation of the Prediction Error Method
5. Evaluation of the quality of an identified model (bias and variance)
6. Determination of the model structure : validation tools
7. Discussion of the design parameters in system identification : sampling period, number of data points, prefilters, choice of excitation signal, etc..
Most of the courses will be presented by the students ; each presentation will be followed by a thorough discussion/evaluation. In addition, the major piece of work for this course will consist of the estimation and validation of an adequate model for a real system for which an input/output data set is available.

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

Prerequisites :
It is beneficial but not mandatory, to have followed the course INMA2731 (Stochastic Processes, estimation and prediction).
Support :
The course is mainly based on the book "System Identification - Theory for the user" by Lennart Ljung, Prentice Hall, 1999.
Evaluation :
The evaluation is based on the presentation of a course and on the identification of a model on the basis of real input/output data. This identification work is performed with the Matlab System Identification Toolbox, developed by L. Ljung.

Programmes in which this activity is taught

FSA3DS　　　　　Diplôme d'études spécialisées en sciences appliquées
MAP2　　　　　　Ingénieur civil en mathématiques appliquées

Other credits in programs

ELEC22	Deuxième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)
ELEC23	Troisième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)
ELME22/M	Deuxième année du programme conduisant au grade d'ingénieur civil électro-mécanicien (mécatronique)	(5 credits)
MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(5 credits)