<u>Course Syllabus</u>

1. Course number and name: **020IPRES5 – System identification**

2. Credits and contact hours: **2 credits, 30 contact hours + 12 lab hours**

3. Instructor's or course coordinator's name: **Flavia KHATOUNIAN**

4. Text book
   a. Jacques Richalet, *Pratique de l'identification*, Editions HERMES.
   b. Lucien Povy, *Identification des processus*, Editions BORDAS, Dunod Université.
   c. Maurice Rivoire, Jean-Louis Ferrier, *Commande par calculateur – Identification*, Editions Eyrolles.
   d. Ioan Doré Landau, *Identification et commande des systèmes*, Editions HERMES.
   e. other supplemental materials: PowerPoint presentation, Notes, Exercises, Lab experiments instructions

5. Specific course information
   a. brief description of the content of the course (catalog description)
   This course starts with an introduction to plants and systems modeling with an emphasis on the type of models as well as the representation methods. Different techniques are studied for the identification of nonparametric models both in the time and frequency domains: correlation method, Fourier analysis, spectral analysis, closed loop identification… Pseudo-random binary signals are then detailed and designed for identification purposes. Least squares method and its derivatives are studied for the identification of parametric models. Application exercises and lab workshops are included to show the effectiveness of the different techniques as well as their respective practical aspects.

   b. prerequisites or co-requisites: **020SCNES3 – Digital Systems and Control**

   c. Required/Elective/Selected Elective: **Selected Elective, required for the Industrial Systems Track**

6. Specific goals for the course
   a. specific outcomes of instruction
- Differentiate the type of models and the representation methods.
- Design a proper pseudo random binary signal.
- Choose and apply in simulation the appropriate identification technique.
- Become familiar with the Identification Toolbox of Matlab.
- Practice parametric and nonparametric identification algorithms on experimental setups.

b. KPIs addressed by the course

KPI	a1	b1	b2	b3	e2	e3	k1	k2	k3
Covered	x	x	x	x	x	x	x	x	x
Assessed				x	x	x	x	x	x
Give Feedback									

7. Brief list of topics to be covered and approximate lecture hours:

- Course introduction (2.5 hours)
- Plants and systems models: type of models and representation methods (2.5 hours)
- Identification of nonparametric models in the time and frequency domains: correlation method, Fourier analysis, spectral analysis, closed loop identification (5 hours)
- Pseudo ransom binary signal: properties and design for identification purposes (3.75 hours)
- Parametric models identification: least squares technique, recursive, weighted, instrumental variables… (5 hours)
- Matlab Identification Toolbox (1.25 hours)
- Workshops using Matlab/Simulink (10 hours)
- Experimental identification and control of a linear system (12 lab hours)