

## Faculty of Applied Sciences



### ELEC2900 Signal processing

[30h+30h exercises] 5 credits

This course is taught in the 2nd semester

**Teacher(s):** Benoît Macq, Luc Vandendorpe  
**Language:** French  
**Level:** Second cycle

#### Aims

At the end of this lecture, the students will be able to

- make the link between the analog description of sampling and sequences,
- modify the sampling rate of a discrete time signal i.e., upsample or downsample lowpass or passband signals, deterministic or random; implement these operations by means of efficient structures, in particular polyphase structures,
- understand the consequences of sampling the spectrum,
- design from a spectral template, finite impulse response (FIR) filters by means of different optimum and suboptimum methods,
- design from a spectral template, infinite impulse response (IIR) filters; understand and use the bilinear transform; design filters based on criteria discussed in "INMA2731 : Processus stochastiques",
- design systems for processing multidimensional signals, in particular images,
- understand and use linear transformations for decorrelation, multiresolution analysis, and discriminant analysis

#### Main themes

Identical to the contents of the course

#### Content and teaching methods

- Sampling : Shannon sampling theorem ; notions of sequence,
- Sampling rate conversion : interpolation, downsampling, lowpass and bandpass signals, deterministic and random signals,
- Structures and graph theory (introduction), polyphase components,
- Discrete Fourier transform,
- Finite impulse response filters,
- Basics of analog filters and templates,
- Bilinear transform and design of infinite impulse response filters
- Processing of random signals,
- Processing of multidimensional signals,
- Denoising and singularity detection,
- Orthogonal transforms,
- Decorrelative transforms,
- Wavelet transform,
- Linear discriminant transform,
- Non parametric (periodogram) and parametric (process identification) spectral analysis

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

Teaching and learning method :

There will be lectures interleaved with practical training (in teaching room or computation center with MATLAB)

Prerequisites :

INMA1731 : Random processes : estimation and prediction

Assessment :

Written examination about exercices, with notes

Could be given in English

**Other credits in programs**

<b>ELEC22</b>	Deuxième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)	Mandatory
<b>ELEC23</b>	Troisième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)	
<b>FSA3DA</b>	Diplôme d'études approfondies en sciences appliquées	(5 credits)	
<b>FSA3DS/TL</b>	Diplôme d'études spécialisées en sciences appliquées (télécommunications)	(5 credits)	