

## Faculty of Applied Sciences



### ELEC2360 Telecommunications 1 : Channels and signals

[30h+30h exercises] 5 credits

This course is taught in the 2nd semester

**Teacher(s):** Danielle Janvier, Luc Vandendorpe  
**Language:** French  
**Level:** Second cycle

#### Aims

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

- provide the main characteristics (time, frequency, sensitivity) of signals likely to be transmitted over a communication system;
- describe the origin and the parameters of noise sources;
- compute the main parameters of transmission lines (lossy or lossless);
- define and use the concepts of reflection coefficient and standing wave ratio (VSWR) as well as the Smith chart;
- make use of bandpass signals; deterministic or random, with the help of their baseband representation;
- explain and describe with equations the different types of amplitude modulation, the associated demodulation operations and the effect on the spectra;
- explain and show by means of equations the effect of noise on amplitude;
- use mixing with a sinusoidal carrier to move spectra;
- explain and show by means of equations the effect of noise on frequency modulation;
- understand the superheterodyne receiver

#### Main themes

Identical to the contents of the course

#### Content and teaching methods

- Signals : speech, audio, image, video, data
- Analysis of the electromagnetic fields in transmission lines, fundamental parameters of lossless and lossy transmission lines
- Fundamental equations of transmission lines in harmonic regime : voltage, current, line impedance, reflection coefficient and voltage standing wave ratio
- Construction and use of the Smith Chart, matching methods
- Line matching and conjugate matching, power transfer
- Calculation of transients on transmission lines
- Noises : thermal noise, impulse noise
- Signals and systems : analytic signal, complex envelope, random signals
- Decibels
- Analog modulations : DSB (SC), SSB, VSB, demodulation, noise effect, frequency change
- Angle modulations : FM (narrow and wide band), demodulation, noise effect, capture, threshold effect
- Superheterodyne receiver

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

There will be lectures interleaved with practical training (in teaching room or computation center with MATLAB and Mefisto 2D)

Prerequisites :

INMA2731

Assessment :

Written examination about exercices, with notes

**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 (5 credits) d'ingénieur civil électricien	
<b>FSA3DS/TL</b>	Diplôme d'études spécialisées en sciences appliquées (5 credits) (télécommunications)	
<b>MAP21</b>	Première année du programme conduisant au grade d'ingénieur (5 credits) civil en mathématiques appliquées	