

## Faculty of Applied Sciences



### ELEC2795 Telecommunications 2 : Digital transmission and radiocommunications

[30h+30h exercises] 5 credits

This course is taught in the 1st semester

**Teacher(s):** Christophe Craeye, Luc Vandendorpe  
**Language:** French  
**Level:** Second cycle

#### Aims

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

- characterize the impairments associated with the sampling and quantization and an analogic signal,
- explain the form, and understand the equations corresponding baseband and passband digital transmission,
- explain the concept of matched filter, explain its interest in a receiver, and compute the associated performance,
- understand the methodology to compute the performance of a system as a function of  $E_b/N_0$ , and apply this methodology to different systems,
- use the mathematical description associated with a bandpass linear modulation and compute the associated spectral efficiency
- provide a discrete time equivalent of an analog communications system (for simulation purposes),
- understand and apply the concept of forward error correction for block or convolutional codes,
- explain and motivate the use of hard and soft decoding,
- compute wave propagation in homogeneous non dispersive conductive and non conductive media
- compute reflection and transmission coefficients at planar interfaces
- identify the parameters of propagation modes in rectangular and parallel plate waveguides and understand the conditions leading to surface waves
- calculate the elementary radiation characteristics of simple antennas
- describe the components of satellite and horizontal transmission links
- compute the power budget and the signal to noise ratio of a herztian communication link

#### Main themes

Identical to the contents of the course

#### Content and teaching methods

- Basics of sampling; quantization, compression
- Baseband transmission : line codes, matched filter, correlation, noise effect, Nyquist criterion, CAP
- Passband transmission : linear modulations, spectral efficiency
- Simulation (discrete time) of a communication chain
- Time multiplexing
- Error correcting codes : block codes, convolutional codes, hard and soft decoding
- Planar, cylindrical and spherical waves; wave propagation in homogeneous media; surface waves
- Guided waves (rectangular and parallel-plate waveguides)
- Fundamentals of antenna theory : radiation by electric and magnetic dipoles, gain and radiation patterns, elementary applications
- Channel of terrestrial and satellite communications
- Link budgets

**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

ELEC2360 : Telecommunications I

Assessment

Written examination about exercices, with notes

**Programmes in which this activity is taught**

**INFO2**                    Ingénieur civil informaticien

**Other credits in programs**

<b>ELEC22</b>	Deuxième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)	Mandatory
<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)	