



Faculté des sciences appliquées

FSA

ELEC2795

**TELECOMMUNICATIONS II : 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: 2nd cycle course

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

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

Other credits in programs

ELEC22	Deuxième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)	Mandatory
ELEC23	Troisième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)	
ELME23/M	Troisième année du programme conduisant au grade d'ingénieur civil électro-mécanicien (mécatronique)	(5 credits)	
FSA3DA	Diplôme d'études approfondies en sciences appliquées	(5 credits)	