UCLouvain	**lelec2900** *2019*	Signal processing

In view of the health context linked to the spread of the coronavirus, the methods of organisation and evaluation of the learning units could be adapted in different situations; these possible new methods have been - or will be - communicated by the teachers to the students.

5 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Jacques Laurent ;Macq Benoît ;Vandendorpe Luc ;
Language :	English
Place of the course	Louvain-la-Neuve
Aims	1 With respect to the AA referring system defined for the Master in Electrical Engineering, the course contributes to the develoopment, mastery and assessment of the following skills : • AA1.1, AA1.2, AA1.3 • AA2.1, AA2.2 • AA6.1 - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • Concerning the lectures, the students are individually evaluated with a written exam, including problems solving, and questions on the theory. • For the numerical exercises on Python, the students are evaluated in computer room (in-session or out-of-session).
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** 14 lectures 12 training sessions
Content	• Sampling: theorem, interpolation, sequence • Sampling rate change: downsampling and interpolation for low-pass signals and bandpass signals, complex envelope • Processing structures and graph theory: switching, transposition, direct and polyphase structures • Discrete Fourier transform, properties, convolution, truncation and window • Finite impulse response filters, phase linearity, types and properties of poles and zeros • Synthesis of FIR filters: window method, frequency response sampling, minimax synthesis and Remez method • Synthesis of IIR filters: Prony method, synthesis method by bilinear transformation • Comparison of the IIR and FIR filters: discussion on the linear phase and the complexity • Non-parametric spectral analysis by the discrete Fourier transform: compromise between the resolution and the level of the secondary lobes • Fast Fourier Transform (FFT) algorithm • Parametric spectral analysis: identification of a auto regressive model - Yule-Walker equation and Levinson-Durbin algorithm • Adapted and adaptive filtering. • Theory of multiresolution and wavelet transforms: links between sampling and projection on a vector space generated by orthonormal basic functions of index type. Examplification by the Haar Transform. • Compressive sensing. • Exercises on the use of Python for the prototyping of signal processing systems
Inline resources	Moodle http://moodleucl.uclouvain.be/course/view.php?id=4843
Bibliography	• Syllabus de cours disponible sur Moodle • Transparents et articles de référence disponibles sur Moodle • Enregistrement de la 1ère moitié du cours, disponible en podcast Lectures notes on Moodle

Faculty or entity in charge	ELEC

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Biomedical Engineering	GBIO2M	5		🔍
Master [120] in Mathematical Engineering	MAP2M	5		🔍
Master [120] in Electrical Engineering	ELEC2M	5		🔍