UCLouvain	lelec2900 2021	Signal processing

5.00 crédits	30.0 h + 30.0 h	Q2

Enseignants	Jacques Laurent ;Vandendorpe Luc ;
Langue d'enseignement	Anglais
Lieu du cours	Louvain-la-Neuve

Acquis d'apprentissage	**A la fin de cette unité d'enseignement, l'étudiant est capable de :**
	
	1 At the end of this learning unit, the student is able to :
	
	    • With respect to the AA referring system defined for the Master in Electrical Engineering, the course contributes to the development, 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".

Modes d'évaluation des acquis des étudiants	• 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).
Méthodes d'enseignement	14 lectures 12 training sessions
Contenu	• 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. Example of the Haar Transform. • Compressive sensing : principles and algorithms. • Exercises on the use of Python for the prototyping of signal processing systems
Ressources en ligne	Moodle https://moodle.uclouvain.be/course/view.php?id=715
Bibliographie	• Course and lecture notes available on Moodle • Slides and reference articles available on Moodle First half of the course available as a podcast
Faculté ou entité en charge:	ELEC

Programmes / formations proposant cette unité d'enseignement (UE)

Intitulé du programme	Sigle	Crédits	Prérequis	Acquis d'apprentissage
Master [120] : ingénieur civil électricien	ELEC2M	5		🔍
Master [120] : ingénieur civil biomédical	GBIO2M	5		🔍
Master [120] : ingénieur civil en mathématiques appliquées	MAP2M	5		🔍