UCLouvain

lelec2900

2024

Signal processing

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Jacques Laurent ;Vandendorpe Luc ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Learning outcomes	**At the end of this learning unit, the student is able to :** At the end of this learning unit, the student is able to : 1 • 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”.
Evaluation methods	• Concerning the lectures, the students are individually evaluated with a (in-session) written exam, including problems solving, and questions on the theory. • Regarding the numerical exercises on Python, the students are individually evaluated off-session, over two distinct evaluations, in a computer room. Each of these two evaluations are organized only once during the semester. The written exam and the in-session evaluations amount to 80% and 20% of the final grade, respectively. The note obtained for the numerical exercises is acquired for all sessions of the academic year.
Teaching methods	The course is composed of • lectures on the topics listed in the course content, • and practical sessions, both classical and numerical. Lectures and practical sessions are given in the classroom exclusively.
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 by impulse invariance and bilinear transformation • Bayesian filtering, Kalman filtering, particle filter, and variants • Theory of multiresolution and wavelet transforms (from the Haar system to other wavelets) • Compressive sensing: principles and algorithms • Numerical exercises in Python related to these topics
Inline resources	Moodle https://moodle.uclouvain.be/course/view.php?id=715
Bibliography	• Course and lecture notes available on Moodle • Slides and reference articles available on Moodle First half of the course available as a podcast
Faculty or entity in charge	ELEC

Programmes containing this learning unit (UE)

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