



5 credits

30.0 h + 30.0 h

Q2

Teacher(s)	Jacques Laurent (compensates Macq Benoît) ;Macq Benoît ;Vandendorpe Luc ;
Language :	English
Place of the course	Louvain-la-Neuve
Aims	<p>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 :</p> <p>1</p> <ul style="list-style-type: none"> <li>• AA1.1, AA1.2, AA1.3</li> <li>• AA2.1, AA2.2</li> <li>• AA6.1</li> </ul> <p>-----</p> <p><i>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".</i></p>
Evaluation methods	Written exam: problems solving and questions about the theory.
Teaching methods	14 lectures 12 training sessions
Content	<ul style="list-style-type: none"> <li>• Sampling: theorem, interpolation, sequence</li> <li>• Sampling rate change: downsampling and interpolation for low-pass signals and bandpass signals, complex envelope</li> <li>• Processing structures and graph theory: switching, transposition, direct and polyphase structures</li> <li>• Discrete Fourier transform, properties, convolution, truncation and window</li> <li>• Finite impulse response filters, phase linearity, types and properties of poles and zeros</li> <li>• Synthesis of FIR filters: window method, frequency response sampling, minimax synthesis and Remez method</li> <li>• Synthesis of IIR filters: Prony method, synthesis method by bilinear transformation</li> <li>• Comparison of the IIR and FIR filters: discussion on the linear phase and the complexity</li> <li>• Non-parametric spectral analysis by the discrete Fourier transform: compromise between the resolution and the level of the secondary lobes</li> <li>• Fast Fourier Transform (FFT) algorithm</li> <li>• Parametric spectral analysis: identification of a auto regressive model - Yule-Walker equation and Levinson-Durbin algorithm</li> <li>• Adapted and adaptive filtering.</li> <li>• Theory of multiresolution and wavelet transforms: links between sampling and projection on a vector space generated by orthonormal basic functions of index type. Exemplification by the Haar Transform.</li> <li>• Exercises on the use of Python for the prototyping of signal processing systems</li> </ul>
Inline resources	Moodle <a href="http://moodleucl.uclouvain.be/course/view.php?id=4843">http://moodleucl.uclouvain.be/course/view.php?id=4843</a>
Bibliography	<ul style="list-style-type: none"> <li>• Syllabus de cours disponible sur Moodle</li> <li>• Transparents et articles de référence disponibles sur Moodle</li> <li>• Enregistrement de la 1ère moitié du cours, disponible en podcast</li> </ul> Lectures notes on Moodle
Faculty or entity in charge	ELEC

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electrical Engineering	<a href="#">ELEC2M</a>	5		
Master [120] in Biomedical Engineering	<a href="#">GBIO2M</a>	5		
Master [120] in Mathematical Engineering	<a href="#">MAP2M</a>	5		