

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

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	<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	<p><b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b></p> <ul style="list-style-type: none"> <li>• Concerning the lectures, the students are individually evaluated with a written exam, including problems solving, and questions on the theory.</li> <li>• For the numerical exercises on Python, the students are evaluated in computer room (in-session or out-of-session).</li> </ul>
Teaching methods	<p><b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b></p> <p>The course is organized in</p> <ul style="list-style-type: none"> <li>• 14 lectures</li> <li>• 12 training sessions</li> </ul> <p>Depending on the Covid-19 security measures, the lectures and the practical sessions will be organized face-to-face, distance or hybrid.</p> <p>The details of this organization, as well as the exact schedule, will be provided on the <a href="#">moodle</a> of the course.</p>
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>• Compressive sensing.</li> <li>• Exercises on the use of Python for the prototyping of signal processing systems</li> </ul>
Inline resources	<p>Moodle</p> <p><a href="http://moodleucl.uclouvain.be/course/view.php?id=4843">http://moodleucl.uclouvain.be/course/view.php?id=4843</a></p>

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> <p>Lectures notes on Moodle</p>
Faculty or entity in charge	ELEC

### Force majeure

Teaching methods	<p>If the sanitary situation allows it, courses and exercise classes will be held in presence. Otherwise, courses and exercise classes will be organised on line, or in comodal format. Students may also be invited to watch podcasts.</p>
Evaluation methods	<p>The evaluation will address subjects covered in the courses, the podcasts and the exercise classes. The examination will be written, individual, and composed of open questions. If the sanitary situation allows it, the examination will be on campus and no material will be allowed. If the situation requires the examination to be organised on line, then it will be an open book examination.</p>

<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 Mathematical Engineering	<a href="#">MAP2M</a>	5		
Master [120] in Biomedical Engineering	<a href="#">GBIO2M</a>	5		