

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

Q1

Teacher(s)	Oestges Claude (coordinator) ;Vandendorpe Luc ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	This course is one of the last courses in the telecommunication cursus. LELEC2796 deals with the PHY layer of wireless communication systems, along three axes : radio channels, signal processing techniques and communication standards.
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> <ul style="list-style-type: none"> <li>• AA1.1, AA1.2, AA1.3</li> <li>• AA2.1, AA2.2, AA2.4</li> <li>• AA3.1</li> <li>• AA4.1, AA4.2, AA4.4</li> <li>• AA5.2, AA5.3, AA5.6</li> <li>• AA6.1, AA6.3</li> </ul> <p><b>At the end of the course, the student will be able to :</b></p> <p>1</p> <ul style="list-style-type: none"> <li>• Define concepts enabling to fully characterize radio channels (narrow- and wideband, as well multi-antenna channels)</li> <li>• Explain through analytical models and Matlab simulations the impact of the propagation channel and co-channel interference on system performance</li> <li>• Describe and compare various multiple access techniques (TDMA/FDMA/CDMA)</li> <li>• Explain, via mathematical representations, and analyze receive techniques (Rake receiver, joint detection, OFDM, SIMO/MISO/MIMO)</li> <li>• Describe the radio interface of wireless communication standards (GSM, UMTS, IS95/UTRA, 3G-LTE), together with the underlying concepts</li> <li>• Present (written report and oral presentation) the results achieved within a group project, consisting in the Matlab implementation of a wireless system in a real-world channel</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> <p>Regarding the course, the oral evaluation is individual (no book/notes allowed) and based on clearly announced objectives (see above).</p> <p>Regarding the project, the evaluation relies on a written group report and an oral group presentation.</p>
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 as</p> <ul style="list-style-type: none"> <li>• 13 lectures</li> <li>• 5 to 6 exercise sessions</li> <li>• a group project</li> </ul>
Content	<ul style="list-style-type: none"> <li>• Introduction to wireless communication systems</li> <li>• Random signals, modulations and detection</li> <li>• Mobile transmission channels</li> <li>• GSM standard</li> <li>• Multiple access techniques</li> <li>• CDMA, Rake reception and diversity</li> <li>• UTRA and WCDMA standards</li> <li>• Multi-carrier and OFDM systems</li> <li>• Multi-antenna channels and systems</li> <li>• MIMO techniques</li> </ul>

	<ul style="list-style-type: none"> <li>• LTE and LTE-A standards</li> </ul>
Inline resources	<p>Moodle</p> <p><a href="http://moodleucl.uclouvain.be/course/view.php?id=8268">http://moodleucl.uclouvain.be/course/view.php?id=8268</a></p>
Bibliography	<p><u>Supports</u></p> <ul style="list-style-type: none"> <li>• Lecture notes available on Moodle</li> <li>• Slides available on Moodle</li> <li>• Reference books available at BST and on Moodle</li> </ul>
Other infos	<p>It is advized to follow LELEC2796 during Master 2.</p>
Faculty or entity in charge	<p>ELEC</p>

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electrical Engineering	ELEC2M	5		