

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
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Teacher(s)	Craeye Christophe ;Janvier Danielle (coordinator) ;Louveaux Jérôme ;Oestges Claude ;Vandendorpe Luc ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	This course is part of the Major orientation in the Master in Electrical Engineering. Starting from bases in electromagnetism and transmission lines, LELEC2795 applies the knowledge to various communication 'or related-systems, such as wireless mobile networks, Earth-Satellite communication Systems, Interferometry and Radar systems and wired transmissions.
Aims	<p>In consideration of the reference table AA of the program "master in electrical engineering ", this course contributes to the development, to the acquisition and to the evaluation of the following experiences of learning:</p> <ul style="list-style-type: none"> <li>• AA1.1, AA1.2, AA1.3</li> <li>• AA2.1, AA2.2, AA2.4</li> <li>• AA3.2</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>• Calculate the propagation of electromagnetic waves in homogeneous media, as well as reflection and refraction on dielectric and metallic boundaries and calculate the electromagnetic fields in various transmission lines (coaxial cable, waveguide, etc.)</li> <li>• Select the category of antenna systems for a given wireless link</li> <li>• Evaluate the effects of non-idealities of the front-end transmitters and receivers</li> <li>• Understand the principle propagation mechanisms in wireless mobile networks and their impact of system performance</li> <li>• Understand and use performance metrics for wired and wireless communication links and networks</li> <li>• Determine the link between radar data and scattering cross-sections.</li> <li>• Exploit simple imaging or positioning algorithms on data from antenna array systems.</li> <li>• Understand the basic issues and challenges of wired communications (DSL, optical fiber transmission).</li> <li>• Determine the attenuation due to the troposphere on earth-space links for geostationary satellites.</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>The students have a written examination, based on the objectives described above. The students have at disposal the copy of the slides, without any written annotation.</p> <p>The evaluation of the project is a report, individual or for a group of 2 students.</p>
Teaching methods	<p>The course is organized in</p> <ul style="list-style-type: none"> <li>• 12 courses of 2h</li> <li>• 10 supervised exercises of 2h</li> <li>• 2 laboratories : one using multiple-antenna systems and one on the use of RAPIDS software for the evaluation of an earth-satellite link budget</li> </ul>
Content	<ul style="list-style-type: none"> <li>• Radiowave propagation in homogeneous media ( reflection and refraction on planar boundaries)</li> <li>• Radiowave propagation in waveguides</li> <li>• Effects of the non-idealities of the front-end of the transmitter and receiver circuits</li> <li>• Concepts of mobile cellular communication systems: cell, interferences, multiple access, multiplexing, fading, diversity</li> <li>• Mobile radio propagation (path-loss, shadowing and fading)</li> <li>• Radar scattering, systems and algorithms</li> </ul>

	<ul style="list-style-type: none"> <li>• Issues and challenges in wired systems: DSL and optical fibers.</li> </ul>
Inline resources	<p>Moodle</p> <p><a href="http://moodleucl.uclouvain.be/course/view.php?id=7817">http://moodleucl.uclouvain.be/course/view.php?id=7817</a></p>
Bibliography	<ul style="list-style-type: none"> <li>• Syllabus de cours disponibles sur Moodle</li> <li>• Transparents disponibles sur Moodle</li> <li>• Livres de référence disponibles à la BST</li> </ul>
Other infos	<p>The following courses (or equivalent) are prerequisites: LELEC1360 Telecommunications and LELEC1350 Electromagnetism or equivalent</p>
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	ELEC2M	5		