

Teacher(s)	Oestges Claude (coordinator) ;Vandendorpe Luc ;Wiame Charles (compensates Vandendorpe Luc) ;
Language :	English > French-friendly
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.
Learning outcomes	<p>At the end of this learning unit, the student is able to :</p> <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"> • AA1.1, AA1.2, AA1.3 • AA2.1, AA2.2, AA2.4 • AA3.1 • AA4.1, AA4.2, AA4.4 • AA5.2, AA5.3, AA5.6 • AA6.1, AA6.3 <p>At the end of the course, the student will be able to :</p> <p>1</p> <ul style="list-style-type: none"> • Define concepts enabling to fully characterize radio channels (narrow- and wideband, as well multi-antenna channels) • Explain through analytical models and Matlab simulations the impact of the propagation channel and co-channel interference on system performance • Describe and compare various multiple access techniques (TDMA/FDMA/CDMA) • Explain, via mathematical representations, and analyze receive techniques (Rake receiver, joint detection, OFDM, SIMO/MISO/MIMO) • Describe the radio interface of wireless communication standards (GSM, UMTS, IS95/UTRA, 3G-LTE), together with the underlying concepts • 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
Evaluation methods	<p>Regarding the course, the oral (and/or written) evaluation is individual (no book/notes allowed) and based on clearly announced objectives (see above).</p> <p>The evaluation of the project is based on the submission of a written report and an oral presentation by the group; the acquired project grade holds for all sessions (January and August).</p> <p>The final grade is obtained by combining the grades of the exam and the project as follows</p> <ul style="list-style-type: none"> • if the 2 marks are equal to or higher than 7/20, the project is worth 1/3 of the overall mark; • if one of the two marks is strictly less than 7/20, the overall mark is the minimum of the two marks.
Teaching methods	<p>The course is organized as</p> <ul style="list-style-type: none"> • 13 lectures • 5 to 6 exercise sessions • a group project
Content	<ul style="list-style-type: none"> • Introduction to wireless communication systems • Random signals, modulations and detection • Mobile transmission channels • GSM standard • Multiple access techniques • CDMA, Rake reception and diversity • UTRA and WCDMA standards • Multi-carrier and OFDM systems • Multi-antenna channels and systems • MIMO techniques • LTE and LTE-A standards

Inline resources	https://moodle.uclouvain.be/course/view.php?id=1465
Bibliography	<p><u>Supports</u></p> <ul style="list-style-type: none"> • Lecture notes available on Moodle • Slides available on Moodle • Reference books available at BST and on Moodle
Other infos	It is advized to follow LELEC2796 during Master 2.
Faculty or entity in charge	ELEC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Electrical Engineering	ELEC2M	5		