lelec2796

2024

UCLouvain

Wireless communications

5.00 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Oestges Claude (coordinator) ;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	**At the end of this learning unit, the student is able to :** With respect to the AA referring system defined for the Master in Electrical Engineering, the course contributes to the develoopment, mastery and assessment of the following skills : • 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 **At the end of the course, the student will be able to :** • 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	Students are assessed solely on the basis of the project carried out during the term. Project assessment is based on • an intermediate assessment (around mid-term), accounting for 1/3 of the final grade, • a final assessment, during the session, consisting in an oral presentation by the group (and, possibly, a written report), accounting for 2/3 of the final grade. The project grade is acquired for all sessions (January and August).
Teaching methods	The course consists in • lectures • a 2-3 student group project on network design (python)
Content	• Mobile transmission channels • Multi-antenna (MIMO), radar and vehicular channels and systems • Multiple access techniques • Multi-user MIMO techniques • LTE, LTE-A and NR standards (4G and 5G) This teaching unit also tackles issues linked to sustainable development and transition through the project, which namely addresses sustainable wireless network design metrics (exposure, energy efficiency, etc.).
Inline resources	https://moodle.uclouvain.be/course/view.php?id=1465

Bibliography	<u>Supports</u> • 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		🔍