lepl1508
2021

Project 4 (in electricity)

5.00 credits	30.0 h + 22.5 h	Q2

Teacher(s)	Craeye Christophe (coordinator) ;Oestges Claude ;Vandendorpe Luc ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	This project supposes acquired the notions developed in the courses **LEPL1106** and **LEPL1755**. *The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes	The project is linked to the courses of the major orientation ELEC: devices and electronic circuits, telecommunication, electromagnetism, automatic, control of electrical systems. Examples of systems and existing data will be chosen among information systems, electrical transducers, spectral analysis of real signals including noise, hardware (circuits and systems) and software implementation(signal processing, real time), etc.
Learning outcomes	**At the end of this learning unit, the student is able to :** **Contribution of the course to the program objectives** Regarding the learning outcomes of the program of Bachelor in Engineering, this course contributes to the development and the acquisition of the following learning outcomes: • LO 1.1, 1.2 • LO 2.6, 2.7 • LO 4.6 **Specific learning outcomes of the course** The skills addressed by « Project 4 » include on one hand transverse skills, common to all projects 4, and on the other hand disciplinary, technical skills that are specific to each engineering specialty. Transversal learning outcomes: Projects 4 aim at providing students with transversal skills close to the practice of engineering jobs within a multi-disciplinary context : • analyse and improve existing systems ; • analyse experimental data with a critical mind ; • make the distinction between reality and models used to describe or modify it ; • deal with the notion of uncertainty in the project approach, its conception and the obtained results. The project will allow for a trial-and-error approach, typically adopted by young engineers at the beginning of their careers. Disciplinary learning outcomes: At the end of the course, students will have increased their knowledge in • electromagnetic modelling of the transmission channel, • signal processing and estimation of parameters in noise, • microwave circuits. *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'.*

Evaluation methods	In the framework of this course, students are assessed by : • a continuous assessment of the project, counting for 70% of the final grade (in the first and second semester), which includes a compulsory written report and presentation to be delivered at the end of the semester, carried out in groups; • an individual written examination accounting for 30% of the final mark, carried out at the end of the term (first session) or in the second session. The grade for the continuous assessment (including the report and the oral presentation) is individualised according to the student's involvement in the group during the term (compulsory attendance at the activities, active participation in the intermediate work and the assessed work). The work for which a continuous assessment mark is awarded may not be repeated in the second session; the continuous assessment mark acquired in the first session is retained in the event of a second session.
Teaching methods	Work in small groups with a tutor, 2 or 3 milestones with interim presentations by the students.
Content	The project consists of several steps: • discover and understand the concept of Ultra Wide Band (UWB) and the geolocation methods using time of arrival • understand and justify the presence of the various components of the emitter and receiver transmission (RF source, DC block, mixer, low noise amplifier, noise figure, antennas, propagation channel, oscilloscope, etc.) • estimate the channel and time of arrival (maximum likelihood estimator, cross correlation, Cramer-Rao Bound (CRB), etc.) • estimation the position (direct localization, trilateration, Time-of-Arrival technique (TOA) and time-difference-of-arrival (TDOA), • calculate performance statistics: mean, variance, bias and distribution (estimation of time-of-arrival, position, channel model, etc.) • evaluate the impact of multiple reflections on the received signal, using panels of different materials, • apply the results in specofic contexts.
Inline resources	https://moodleucl.uclouvain.be/course/view.php?id=8884
Other infos	This course is part of the set of courses « Project 4 » of the program of bachelor in engineering. Projects 4 share common transversal objectives, but exist under different versions oriented towards specific disciplinary objectives, corresponding to the bachelor tracks. Each student chooses the project related to one of his/her tracks.
Faculty or entity in charge	ELEC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Bachelor in Engineering	FSA1BA	5	LEPL1106	🔍