LELEC2595

2015-2016

Power quality

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	De Jaeger Emmanuel ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	Moodle > http://moodleucl.uclouvain.be/course/view.php?id=5323
Main themes :	- The topic of voltage disturbances and quality of electric power supply, positioned in the general context of electromagnetic compatibility (EMC) - Types and characteristics of the main disturbances, disturbance sources, methods of measurement and evaluation, propagation mechanisms, adverse effects, immunity - Modelling and calculation of electrical power networks (public or industrial) and electrical installations in disturbed operation - Technical solutions to solve power quality problems
Aims :	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 : -- AA1.1, AA1.2, AA1.3 -- AA2.1, AA2.2, AA2.3 -- AA3.1, -- AA5.4, AA5.6 -- AA6.1 Specifically, at the end of the course, students will be able to: -- Identify, describe and analyze a problematic situation regarding electrical voltage disturbances (diagnosis, curative approach) -- Prevent problematic situations at the project stage of electrical installations (preventive approach) -- Propose realistic solutions from the technical and economic perspectives To this end, they will be able to: -- Describe precisely and explain physical phenomena and mechanisms underlying power quality, -- Select measurement techniques, adequate analysis and assessment methods, -- Model and quantify problematic situations, -- Interpret and correctly apply the standardization concepts, -- Analyze and interpret information from technical and scientific literature relating to issues addressed in the course. Transversal learning outcomes: -- Be familiar with standardization practices in electrotechnology, -- Structure, detail and present an engineering calculation report. *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 :	Students are assessed during an oral examination comprising: -- The resolution of a problem, sketching a realistic but inevitably simplified situation compared to a complex real industrial case (numerical exercise, aiming primarily to assess understanding phenomena, mastering modelling and computational techniques, together with the fast quantified assessment of a situation) -- A discussion realizing a broad sweep of the whole matter, starting from relatively general questions or typical industrial case studies. Students may have the courses and their personal notes supports. A quarter of the final grade will be awarded to the evaluation of a prepared and guided reading. Three quarters of the final grade will be awarded for the oral examination session.
Teaching methods :	- The course consists of lectures that aim to describe the general context, key concepts, methods of calculation and evaluation as well as give and discuss some specific technological information. - These presentations are complemented by mandatory readings that are presented, commented and discussed in dedicated sessions. These readings are intended to deepen and illustrate the concepts developed in the lectures. They involve case studies or investigations of specific results or measurement campaigns (they are, for example, based on papers presented at recent professional conferences). Everyone is asked to read the articles in advance. Each reading will be especially prepared by a group of two or three students who will have the task of presenting to the group, to comment and lead a discussion. - Practical sessions (supervised exercise sessions) are organized. These exercises can make use of dedicated software tools
Content :	- Generalities about electromagnetic compatibility and basic concepts used in voltage quality (short-circuit power concept, types of networks - TN, TT, IT ... - Basic concepts of standardization, compatibility levels, immunity levels, general principles of measuring methods, basics of quality statistical analysis, quality indices etc.) - Reliability and continuity of power supply - Rapid changes of the load; voltage fluctuations and frequency deviations - Voltage distortion, harmonics, transients and interharmonics (in the frequency range from 0 to 150 kHz) - Unsymmetrical three-phase systems (voltage unbalance) - Voltage dips and short interruptions - Voltage swells and overvoltages - For each family of studied phenomena: sources and disturbances generating mechanisms, modelling, special techniques of measurement and evaluation, propagation of disturbances in the network, adverse effects, immunity of sensitive loads, choice of technological solutions (at the source, in the network or at the level of disturbed installations).
Bibliography :	Copy of the slides, additional documentation, links on Moodle
Other infos :	It is recommended to have previously completed the course LELEC2520 or an equivalent According to the opportunities and practical availability, the course can be completed by a technical visit and / or seminars given by experts from industry
Faculty or entity in charge:	ELEC

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Master [120] in Electrical Engineering	ELEC2M	5	-	
Master [120] in Physical Engineering	FYAP2M	5	-	
Master [120] in Electro-mechanical Engineering	ELME2M	5	-	