LELEC2811

2016-2017

Instrumentation and sensors

5.0 credits	30.0 h + 30.0 h	1q

Teacher(s) :	Bol David ; Francis Laurent ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	Moodle > http://moodleucl.uclouvain.be/course/view.php?id=3733
Prerequisites :	Students are expected to master the following skills: continuous-time and discrete-time signal representation both in time and frequency domains, mathematical system representations (transfer function, impulse response, filtering), principles and properties of Fourier, Laplace and z transforms, analysis of electrical circuits based on passive components (R, L, C), in DC, transient and AC regimes, understanding of general behavior of operational amplifiers, diodes and transistors with the associated basic electronic circuits, as they are covered within the courses LFSAB1106, LELEC1370 and LELEC1530
Main themes :	Our world is more and more digital with the increasing presence of information and electronic systems in industry, transportation, health cares and everyday's life. Many of the digital applications in these fields require the automatic acquisition of quantities from the physical world. In this course, we study the instrumentation chain and the sensors capable to perform this acquisition of physical quantities to translate them into analog electrical signals and then digital data. In this course, we will present different types of sensors used for the transduction of several physical values, e.g., occupancy, mechanical, acoustic, optical, bio/chemical, ' and the associated electronic circuits for signal conditioning and data transmission. We will highlight the figures of merit of the instrumentation chain and all sources of errrors along it
Aims :	With respect to the AA referring system defined for the Master in Electrical Engineering, the course contributes to the developpment, mastery and assessment of the following skills : -- AA1.1, AA1.2, AA1.3 -- AA2.1, AA2.2 -- AA3.1, AA3.3 -- AA4.1, AA4.2, AA4.3, AA4.4 -- AA5.3, AA5.4, AA5.5 After this course, the student will be able to : -- Describe the operation principles of various classes of sensors -- Select sensors for a given application -- Size, realise and characterise a complete instrumentation chain -- Understand and use datasheets -- Present a written report of the results of group project *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 :	Individual oral exam with preparation time and group reports on the problems asked during the year.
Teaching methods :	The lecture is following the problem-based learning. A restructuration lecture follows each problem in order to guide the learning process.
Content :	The lecture is looking at various basic disciplines that are targeted to sensors and their associated instrumentation. -- Fundamental metrology and systems characterisation methods to quantitatively evaluate the performances of a measurement chain. -- Principles ruling the conversion from primary physical values to electrical values. --

	Analogic signal conditioning (instrumentation amplifiers, '). -- Numeric signal conditioning (converters, filters, '). -- The application of processors in instrumentation. Some frequent application in the industrial field will be considered : measure of displacement, speed, force, acceleration, pressure, temperature, '
Bibliography :	Supports -- Syllabus and slides available on Moodle -- Reference book available at the Library of Science and Technology : J. Fraden, Handbook of Modern Sensors: Physics, Designs, and Applications. 4th ed. Springer, 2010. ISBN: 9781441964656
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 Biomedical Engineering	GBIO2M	5	-	
Master [120] in Physical Engineering	FYAP2M	5	-	
Master [120] in Electro-mechanical Engineering	ELME2M	5	-	
Master [120] in Electrical Engineering	ELEC2M	5	-	