




Teacher(s)	Bol David coordinator ;Francis Laurent ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	<p>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.</p> <p>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 errors along it</p>
Aims	<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 • AA3.1, AA3.3 • AA4.1, AA4.2, AA4.3, AA4.4 • AA5.3, AA5.4, AA5.5 <p>1</p> <p>After this course, the student will be able to :</p> <ul style="list-style-type: none"> • 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 <p>-----</p> <p><i>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".</i></p>
Evaluation methods	<ul style="list-style-type: none"> • Group assignments on a project during the semester. • Individual written exam.
Teaching methods	The course combines lectures to introduce the key concepts with project-based learning on a group project.
Content	<p>In this course course, we study the key basic concepts in sensor systems and their associated instrumentation.</p> <ul style="list-style-type: none"> • Fundamental metrology and sensor characterisation • Noise, non idealities and calibration in sensor systems • Principles of transduction ruling the conversion from primary physical values to electrical values. • Analogic signal conditioning (sensor interface, instrumentation amplifier, filters, instrumentation bridges). • Data acquisition • Digital signal processing (denoising) and data processing (feature extraction, event detection, classification). • Some frequent applications in the industrial field will be considered: measure of displacement, speed, force, acceleration, pressure, temperature, light, acoustic.
Inline resources	<p>Moodle</p> <p>http://moodleucl.uclouvain.be/course/view.php?id=3733</p>
Bibliography	<ul style="list-style-type: none"> • Transparents des cours, chapitres du livre de référence, disponibles sur Moodle <p>Livre de référence disponible à la BST : J. Fraden, Handbook of Modern Sensors: Physics, Designs, and Applications. 4th ed. Springer, 2010. ISBN: 9781441964656.</p>
Faculty or entity in charge	ELEC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Physical Engineering	FYAP2M	5		
Master [120] in Biomedical Engineering	GBIO2M	5		