UCLouvain	lphy2239 2018	Data acquisition, digital electronics and microelectronics

5 credits	22.5 h + 22.5 h	Q2

Teacher(s)	Cortina Gil Eduardo ;Piotrzkowski Krzysztof ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	The teaching unit has been conceived as an introduction to digital electronics and data acquisition systems.
Aims	**a. Contribution of the teaching unit to the learning outcomes of the programme** 1.2, 1.5, 2.2, 2.3, 2.4, 4.1, 4.2, 4.4, 5.1, 5.3, 6.4, 6.5 **b. Specific learning outcomes of the teaching unit** At the end of this teaching unit, the student will be able to : 1. know the different numeral systems (binary, octal, hexadecimal, ') and know how to make conversion among them; 2. describe how digital devices work in terms of the fundamental logical operations; 3. analize and design a finite state machine; 4. use a simple communication protocol (I2C, USB, OneWire, ') to readout a captor; 5. program an FPGA using VHDL (or Verilog); 6. link a FPGA to a computer. - - - - *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".*
Teaching methods	This teaching unit is divided into two activities: study of digital electronics and data acquisition basics following the reference book [1] and programming a basic and simple daq system in a FPGA development board. Every week some chapters of the reference book are reviewed during the lectures. Students should have read the assigned chapters before and during the lectures. Doubts encountered by the students are discussed and special topics are further developed. The topics discussed can be found in the section "Material" (toc.pdf) as well as the distribution of topics (planning.pdf) For the practical part, every student receives a FPGA development board and a set of sensors. Details and further documentation on this board, as VHDL manuals and references, can be found down in section ALTERA-DE1. Few practical sessions are organized to show the student how to use the FPGA development board.
Content	Digital and analog signals and systems. Number systems, operations and codes. Logic gates and gate combinations. Combinational logic: adders, decoders, comparators, multiplexers, '. Sequential logic: flip-flops, timers, shift registers, counters, '. Counters: finite state machines. Programmable logic: VHDL. Data transmission. Signal conversion: ADC, DAC, '. Buses and interfaces: serial and parallel buses, USB, I2C, Ethernet.

Bibliography	1. Digital Fundamentals 11th edition (http://www.pearsonglobaleditions.com/Sitemap/Floyd/)
	    Thomas Floyd
	    Ed. Pearson
	2. Acquisition de Données. Du capteur à l'ordinateur
	    Georges Asch et collaborateurs
	    Ed. Dunod
	3. The Physics of Information Technology
	    Neil Gershenfeld
	    Cambridge University Press

Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Physics	PHYS2M	5		🔍
Additionnal module in Physics	LPHYS100P	5		🔍