UCLouvain

lphys2104

2025

Data acquisition, digital electronics and microelectronics

The version you're consulting is not final. This course description may change. The final version will be published on 1st June.

5.00 credits	22.5 h + 22.5 h	Q1

Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	No pre-requisites. However, having followed LPHY2103 is an asset.
Main themes	This teaching unit is designed to introduce the student to digital electronics and data acquisition systems with special emphasis in a practical work through a personal project.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1. **Contribution of the teaching unit to the learning outcomes of the programme (PHYS2M and PHYS2M1)** AA1: A1.1, A1.5 AA2: A2.5 1. **Specific learning outcomes of the teaching unit** At the end of this teaching unit, the student will be able to : 1. 1. Describe how digital devices works in terms of the fundamental logical operations ; 2. Analize and design a finite state machine ; 3. Use a simple communication protocol (I2C, USB, OneWire, …) to readout a sensor. 4. Program an FPGA using VHDL (or Verilog) 5. Link a FPGA to a computer.
Evaluation methods	The evaluation is based on: - laboratory work. Continuous evaluation (25%) - Weekly exercices and assignements. Continuous evaluation (25%) - presentation of an acquisition project : oral questioning (50%). All three parts should be passed with more than 50% each.
Teaching methods	Lectures and exercises sessions in auditorium. Directed practical work (compulsory) : - experimental study of basic circuits; - simulation of circuits; - weekly assignments. Project : developing an acquisition system with an FPGA and/or RaspberryPi : - implementation of a serial reading protocol (type I2C, USB, ...) ;
Content	1. Digital and analog signals and systems. 2. Number systems, operations and codes. 3. Logic gates and gate combinations. 4. Combinational logic : adders, decoders, comparators, multiplexers, … 5. Sequential logic : flip-flops, timers, shift registers, counters, … 6. Counters : finite state machines. 7. Programmable logic : VHDL. 8. Data transmission. 9. Signal conversion : ADC, DAC, … 10. 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.
Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Additionnal module in Physics	APPHYS	5		🔍
Master [60] in Physics	PHYS2M1	5		🔍
Master [120] in Physics	PHYS2M	5		🔍