Faculty of Applied Sciences

ELEC2760   Design and optimization of digital circuits and systems

[30h+30h exercises] 5 credits

This course is taught in the 2nd semester

Teacher(s):   Jean-Jacques Quisquater, Charles Trullemans
Language: French
Level: Second cycle

Aims

This course follows the basic course ELEC2620 Logic circuits systems. It is composed of the same chapter titles, but presents a more advanced or more specialized point of view.
The application fields of digital circuits are large and manifold : computers, telecommunications, process command, transports... Their current complexity (expressed in millions of gates) imposes to have recourse to computer assisted design methods.
These are based on synthesis and optimisation methods that are completely different from the techniques that can be used for small-scale circuits (some hundreds to a few thousands of gates). This course aims at letting the students discover systematic methods for the synthesis and optimisation of synchronous circuits

Main themes

Identical to the contents of the course

Content and teaching methods

The problems linked to the architectural synthesis tackle both the temporal (organisation of the operations) and spatial field (distribution of the operation between physical operators). Several optimisation methods for control parts and data pathds, organisation, distribution and sharing of the resources will be studied.
Control logic and calculation resources implement combinatorial circuits that are built through the combination of many elementary library cells. Several cost criteria determine a production : functioing speed, size, power consumption, testability, time of the design. Here, we will also study several methods of synthesis and optimisation.
Finally, a digital system is normally also a sequential system. Its functioning passes through a series of states. The problem studied here is the translation mode that enables switching from an abstract expression of these states (given the specification) to a detailed coding (that defines the combinatorial resources). The translation mode is determined taking into account the cost associated to the coding.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Support :
Books and recent publications will support the course. It will focus on one or another of the above-mentioned fields. We will propose different methods : courses, exercices, personal or group works, occasionally in a computer assisted design environment.
Bibliography :
Synthesis and optimisation of digital circuits, Giovanni de Micheli, McGraw-Hill 1994
Prerequisites :
ELEC2620 : Circuits et systèmes logiques
Assessment :
Written exam
A personal report might be requested

Programmes in which this activity is taught

FSA3DS   Diplôme d'études spécialisées en sciences appliquées

Other credits in programs

ELEC22	Deuxième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)
ELME23/M	Troisième année du programme conduisant au grade d'ingénieur civil électro-mécanicien (mécatronique)	(5 credits)
FSA3DA	Diplôme d'études approfondies en sciences appliquées	(5 credits)
MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(5 credits)