



Institiúid Teicneolaíochta Chorcaí
Cork Institute of Technology

Embedded Hardware Co-Design

Module Details

Short Title:	Embedded Hardware Co-Design DRAFT		
Full Title:	Digital hardware for hardware/software co-design.		
Module Id:	4627		
Official Code:		NFQ Level:	9
		ECTS Credits:	5
Coordinator:	JOSEPH CONNELL		
Description:	This module will cover design techniques for digital hardware for complex real-time embedded systems. It will educate the student in the theory and practice of hardware design as part of hardware/software co-design.		
Learning Outcomes:			
On successful completion of this module the learner will be able to...			
1. Use a development platform for digital system implementation of a hardware/software co-design. 2. Analyze and quantify the hardware/software interaction as part of the co-verification process. 3. Work in a team when required to partition a complex application into a series of sub-blocks that can be divided among team members. 4. Design, implement and verify a specified application on a digital system.			
Pre-requisite learning			
Module Recommendations			
This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named CIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).			
No recommendations listed			
Incompatible Modules			
These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.			
No incompatible modules listed			
Module Requirements			
This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed. You may not enrol on this module if you have not acquired the learning specified in this section.			
The student will be familiar with fundamental concepts of digital electronics and digital circuit design.			



Module Content & Assessment

Indicative Content

• Digital hardware design systems

Discussion and comparison of common digital development environments , covering the hardware and software (e.g. SystemC , Verilog , VHDL). Discussion and comparison of digital ICs used in co-design systems (e.g. common FPGAs , SoC). Introduction to the hardware/software platform used in this module.

• Hardware/software co-simulation and co-verification.

Techniques for linking hardware design to software controllers. Bus and network interfaces.

• Hardware accelerators

Design of accelerated systems as an example of hardware/software co-design. Requirements and features of hardware used in such a system - reliability , redundancy , safety critical.

• Implementation of digital design

Advanced features of the digital platform and the co-design process will be covered by the use of a number of case studies. Possible examples include : ethernet controller , video processor , high speed memory and processor I/O , gigabit serial I/O , audio processor , USB interface.

Assessment Breakdown	%
Course Work	100%
End of Semester Formal Examination	0%

Coursework Breakdown				
Type	Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Design project 1	1,2,3,4	25	Week 6
Practical/Skills Evaluation	Design project 2	1,2,3,4	25	Week 9
Practical/Skills Evaluation	Design project 3	1,2,3,4	50	Week 12

The institute reserves the right to alter the nature and timings of assessment



Module Workload & Resources

Workload		Full-time mode		
Type	Description	Hours	Frequency	Average Weekly Learner Workload
Lecture	Theoretical aspects of the course.	2	Every Week	2.00
Lab	Practical application of theory	2	Every Second Week	1.00
Independent & Directed Learning (Non-contact)	Self-directed learning, revision and preparation.	3	Every Week	3.00
Total Weekly Learner Workload				6.00
Total Weekly Contact Hours				3.00

Workload		Part-time mode		
Type	Description	Hours	Frequency	Average Weekly Learner Workload
Lecture	Theoretical aspects of the course	1	Every Week	1.00
Lab	Practical application of theory	2	Every Week	2.00
Independent & Directed Learning (Non-contact)	Self directed learning, revision and preparation	4	Every Week	4.00
Total Weekly Learner Workload				7.00

Resources	
Supplementary Book Resources	
<ul style="list-style-type: none"> • Pong P Chu 2008, <i>FPGA prototyping by Verilog examples</i>, 1st edition Ed., Wiley [ISBN: 978-0-470-18532-2] • Pong P Chu 2008, <i>FPGA prototyping by VHDL examples</i>, 1st edition Ed., Wiley [ISBN: 978-0-470-18531-5] 	
Other Resources	
<ul style="list-style-type: none"> • website: www.xilinx.com n/a 	