



Institiúid Teicneolaíochta Chorcaí
Cork Institute of Technology

Physical Layer Design

Module Details

Short Title:	Physical Layer Design <div>DRAFT</div>				
Full Title:	Physical Layer Design: design, assembly and testing of a custom wireless sensor node				
Module Id:	4637				
Official Code:		NFQ Level:	9	ECTS Credits:	5

Coordinator:	JOHN BARRETT
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Description:	Overall aim: a priori design and building of a networkable embedded sensor hardware node for a selected application with a greater focus on independent design than in Physical Layer I. This module will support the student in carrying out a-priori design of a networkable embedded sensor hardware node with a particular focus on the application selected in the "Capstone" module and its actual physical embedding in the application. It will cover circuit design, component selection, board design, component and system packaging and system level issues such as power budgeting, design for manufacturability and design for reliability and integration with a network.
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Learning Outcomes:

On successful completion of this module the learner will be able to...

1. Design, build, embed and test a wireless sensor node for a selected application
2. Carry out associated a. circuit design. b. component selection c. board design d. system assembly and packaging e. system test
3. Describe the importance of, and procedures for, power budgeting, design for manufacturability and design for reliability
4. Perform a critical technical review and self-assessment with regard to node design, assembly and test

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.

No requirements listed



Module Content & Assessment

Indicative Content

• Embedded Hardware Electronic Design

a. Sensor selection, signal conditioning and interfacing b. Microcontroller selection, circuit design and programming c. Transceiver selection and circuit design d. Antenna selection and matching networks e. Modulations, communications protocols, propagation, channel budgets and interfacing with the a network f. Power budgeting and low power design; power source selection, power conditioning, power distribution, power harvesting

• Physical embedding

a. Component and package style selection b. Interconnect method selection, placement and routing c. Design for reliability i. Design for signal integrity ii. Design for mechanical reliability iii. Design for environmental reliability d. Pre-manufacture design review e. Node manufacture, assembly and testing

• Base stations and controllers

Wired and wireless communications with base stations and controllers

• Post-test design review

a. Analysis of test and debug results b. feedback to design process

Assessment Breakdown

%

Course Work

100%

End of Semester Formal Examination

0%

Coursework Breakdown

Type	Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Ongoing laboratory based assessment	1,2,3	50	Every Second Week
Written Report	Technical report on node design, assembly and test	1,2,3,4	25	Sem End
Presentation	Presentation on node design, assembly and test	1,2,3,4	25	Sem End

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



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Module Workload & Resources

Workload		Full-time mode		
Type	Description	Hours	Frequency	Average Weekly Learner Workload
Lecture	Laboratory based lectures	3	Every Week	3.00
Independent & Directed Learning (Non-contact)	No Description	4	Every Week	4.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				3.00

Workload		Part-time mode		
Type	Description	Hours	Frequency	Average Weekly Learner Workload
Lecture	Laboratory based lectures	3	Every Week	3.00
Independent & Directed Learning (Non-contact)	No Description	4	Every Week	4.00
Total Weekly Learner Workload				7.00