



Institiúid Teicneolaíochta Chorcaí  
Cork Institute of Technology

## ELTR8016: IC Design

### Module Details

Short Title:	IC Design <div>APPROVED</div>		
Full Title:	IC Design from wafer fab to PCB layout		
Module Id:	3596		
Official Code:	ELTR8016	NFQ Level:	8
		ECTS Credits:	5
Coordinator:	JOSEPH CONNELL		
Description:	This course introduces students to IC circuit design - from the initial design and simulation through to IC layout, packaging and PCB layout.		
Learning Outcomes:			
On successful completion of this module the learner will be able to...			
<div>1. Design, simulate and verify a MOSFET circuit.</div> <div>2. Outline the steps and the choices involved in the IC manufacturing process - front end ( i.e. wafer fab ) and back end ( i.e. packaging ).</div> <div>3. Layout a circuit using IC layout software, run DRC/LVS on the design and simulate the final layout using extracted parameters.</div> <div>4. Discuss the choices to be made in the different package types for ICs - taking into account issues such as cost, reliability, speed, etc.</div> <div>5. Design a PCB and/or PCB enclosure for a high speed, low noise and reduced emissions application. Outline and quantify any design techniques needed to meet the application requirements.</div>			
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).			
Students will have a knowledge of electronic components and circuit theory.			
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.			
Students will have a knowledge of electronic components and circuit theory.			



## Module Content &amp; Assessment

**Indicative Content**

- **MOSFET circuits**  
Analysis, design and simulation of MOSFET circuits ( e.g. current source, diff amp, op-amp )
- **Wafer fabrication process**  
Description of the steps involved in the wafer fabrication process.
- **IC layout**  
IC layout process. IC layout techniques. IC layout software.
- **IC packaging.**  
Parameters and options available in IC packaging.
- **PCB layout.**  
PCB layout techniques for high speed performance, reduced emissions and low noise circuits.

Assessment Breakdown	%
Course Work	50%
End of Semester Formal Examination	50%

	Outcome addressed	% of total	Assessment Date
<b>Formal End-of-Semester Examination</b>	1,2,4,5	50%	Semester End

Coursework Breakdown				
Type	Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Practical evaluation of class room theory.	1,3,5	20	Week 4
Practical/Skills Evaluation	Practical evaluation of class room theory.	1,3,5	20	Week 7
Practical/Skills Evaluation	Practical evaluation of class room theory.	1,3,5	10	Week 10

**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	Theory and problem solving skills	2	Every Week	2.00	
Lab	Practical application of theory.	2	Every Week	2.00	
Independent & Directed Learning (Non-contact)	Revision. Practical processing.	3	Every Week	3.00	
Total Weekly Learner Workload				7.00	
Total Weekly Contact Hours				4.00	

Workload		Part-time mode			
Type	Description	Hours	Frequency	Average Weekly Learner Workload	
Lecture	Theory and problem solving skills.	1.5	Every Week	1.50	
Lab	Practical application of theory.	1.5	Every Week	1.50	
Independent & Directed Learning (Non-contact)	Revision. Practical processing.	3	Every Week	3.00	
Total Weekly Learner Workload				6.00	

Resources	
<i>Supplementary Book Resources</i>	
<ul style="list-style-type: none"> <li>• Department of Electronic Engineering., <i>Lecture notes</i>.</li> <li>• R Jacob Baker 2004, <i>CMOS Circuit Design, Layout, and Simulation</i>, 2nd Edition Ed. [ISBN: 978-0471700555]</li> <li>• Alan Hastings 2005, <i>The Art of Analog Layout</i>, 2nd Edition Ed. [ISBN: 978-0131464100]</li> <li>• Mark I. Montrose 1998, <i>Emc &amp; the Printed Circuit Board: Design, Theory, &amp; Layout Made Simple</i>, 1st Edition Ed. [ISBN: 978-0780347038]</li> </ul>	
<i>Other Resources</i>	
<ul style="list-style-type: none"> <li>• Software: <i>IC layout software</i>.</li> </ul>	