

<b>Title:</b>	Power Conversion <b>APPROVED</b>
<b>Long Title:</b>	Power Electronic Converters and their Applications
<b>Module Code:</b>	ELEC7013
<b>Credits:</b>	5
<b>NFQ Level:</b>	Intermediate
<b>Field of Study:</b>	Electrical Engineering
<b>Valid From:</b>	Semester 1 - 2014/15 ( September 2014 )
<b>Module Delivered in</b>	<a href="#">2 programme(s)</a>
<b>Module Coordinator:</b>	JOSEPH CONNELL
<b>Module Author:</b>	
<b>Module Description:</b>	This module develops the student's knowledge of power electronic switching devices, power electronic converters and the application of converters for the efficient use of electric power in different sectors. It enables the student to assess converters, their impact on power systems and to contribute to the design of converters for common applications.
<b>Learning Outcomes</b>	
<i>On successful completion of this module the learner will be able to:</i>	
LO1	Assess the operational characteristics of common power electronic devices.
LO2	Characterise the main features of converter circuits and calculate key values.
LO3	Specify appropriate power electronic converter solutions for common applications.
LO4	Use software and calculation techniques to solve power conversion problems.
LO5	Assess the impact of power conversion techniques on power systems.
<b>Pre-requisite learning</b>	
<b>Module Recommendations</b>	
<i>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).</i>	
Industrial Electronics at Level 6	
<b>Incompatible Modules</b>	
<i>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.</i>	
No incompatible modules listed	
<b>Co-requisite Modules</b>	
No Co-requisite modules listed	
<b>Requirements</b>	
<i>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.</i>	
No requirements listed	
<b>Co-requisites</b>	
No Co Requisites listed	

**Module Content & Assessment**

**Indicative Content**

**Devices**

Power switching devices, ratings, characteristics, data sheets.

**Converters**

Power electronic converters: rectifiers, DC converters, AC converters, inverters. Performance calculations, waveforms, control techniques, equipment standards.

**Applications**

Application of power electronic converters for utilisation: lighting, battery charging, uninterruptible power supplies, general motor control, welding, electroheat, electrolysis, traction.

**Power quality**

Power system impact: power factor, reactive power, waveform analysis, harmonics, total harmonic distortion.

**Testing and simulation**

Testing and simulation of common power electronic converters using hardware and software, and the calculation of key values for design purposes.

Assessment Breakdown	%
Course Work	40.00%
End of Module Formal Examination	60.00%

Course Work				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Analysis of rectifier circuits	1,2,5	10.0	Week 3
Practical/Skills Evaluation	Analysis of DC and AC converters	1,2,4,5	10.0	Week 5
Practical/Skills Evaluation	Analysis of inverters	2,3,4,5	10.0	Week 9
Practical/Skills Evaluation	Analysis of DC and AC variable speed drives	3,4,5	10.0	Week 10

End of Module Formal Examination				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Formal Exam	End-of-Semester Final Examination	1,2,3,4,5	60.0	End-of-Semester

Reassessment Requirement
<p><b>Repeat examination</b></p> <p>Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.</p>

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

**Module Workload**

<b>Workload: Full Time</b>				
<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Class lecture	2.0	Every Week	2.00
Lab	Class laboratory or demonstration	2.0	Every Week	2.00
Independent & Directed Learning (Non-contact)	Student exercise or review	3.0	Every Week	3.00
Total Hours				7.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				4.00

**This module has no Part Time workload.**

Module Resources
<i>Recommended Book Resources</i>
• Hart 2010, <i>Power Electronics</i> , 1st Ed., McGraw-Hill International [ISBN: 9780071289300]
<i>Supplementary Book Resources</i>
<ul style="list-style-type: none"> <li>• Rashid 2004, <i>Power Electronics</i>, 3rd Ed., Pearson Education [ISBN: 0-13-122815-3]</li> <li>• Mohan 2003, <i>Power Electronics</i>, 3rd Ed., Wiley [ISBN: 0-471-42908-2]</li> <li>• Lander 1987, <i>Power Electronics</i>, 2nd Ed., McGraw-Hill [ISBN: 0-07-084162-4]</li> <li>• Baterseh 2004, <i>Power Electronic Circuits</i>, 1st Ed., Wiley [ISBN: 0-471-45228-9]</li> <li>• Shaffer 2007, <i>Fundamentals of Power Electronics with MATLAB</i>, 1st Ed., Thomson [ISBN: 1-58450-852-3]</li> <li>• Arora 2007, <i>Power Electronics Laboratory</i>, 1st Ed., Alpha Science [ISBN: 10-1-84265-301-6]</li> <li>• Ned Mohan, 2012, <i>First Course on Power Electronics</i>, 1 Ed., Wiley [ISBN: 978-1-118-07480-0]</li> </ul>
<i>This module does not have any article/paper resources</i>
<i>This module does not have any other resources</i>

Module Delivered in			
Programme Code	Programme	Semester	Delivery
CR_EEPSY_8	<a href="#"><u>Bachelor of Engineering (Honours) in Electrical Engineering</u></a>	5	Mandatory
CR_EELEC_7	<a href="#"><u>Bachelor of Engineering in Electrical Engineering</u></a>	5	Mandatory