

Module Code:	ENG774
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Module Title:	Circuit Design & Electronic Testing
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Level:	7	Credit Value:	20
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Cost Centre(s):		JACS3 code:	H640
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School:	Applied Science, Computing & Engineering	Module Leader:	Andrew Sharp
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Scheduled learning and teaching hours	40 hrs
Guided independent study	160 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
MSc Engineering (Electrical & Electronic) MSc Engineering (Mechatronics)	✓	

Pre-requisites
N/A

Office use only

Initial approval: 19/06/2018

Version no:1

With effect from: 01/09/2018

Date and details of revision:

Version no:

Module Aims

- To enable students to have a critical awareness of the interrelationships of test and design within the design and manufacturing cycle for modern electronic products
- To enable students to develop original test strategies, analysing typical testing scenarios, utilising case studies and current design/test tools to formulate efficient solutions to real problems.

Intended Learning Outcomes

Key skills for employability

- KS1 Written, oral and media communication skills
 KS2 Leadership, team working and networking skills
 KS3 Opportunity, creativity and problem solving skills
 KS4 Information technology skills and digital literacy
 KS5 Information management skills
 KS6 Research skills
 KS7 Intercultural and sustainability skills
 KS8 Career management skills
 KS9 Learning to learn (managing personal and professional development, self-management)
 KS10 Numeracy

At the end of this module, students will be able to

Key Skills

At the end of this module, students will be able to		Key Skills	
1	Critically evaluate complex electronic circuit designs	KS1	KS10
		KS5	
2	Establish the optimum test methodologies, synthesising test algorithms for efficient and effective test strategies.	KS3	
		KS6	
3	Demonstrate knowledge of cost effectiveness, sustainability, life cycle analysis and ethical considerations in the modern environment of electronic design, manufacture and testing.	KS2	KS8
		KS7	
4	Specify, design and select appropriate Automatic Test Equipment (ATE) and software, and implement a pass/fail test solution, to a professional standard.	KS9	
		KS4	

Transferable skills and other attributes

1. Communication
2. ICT Technologies
3. Time management and organisation
4. Interpersonal skills
5. Problem solving
6. Information handling including numeracy

Derogations

Credits shall be awarded by an assessment board for those Level 7 modules in which an overall mark of at least 50% has been achieved with a minimum mark of 40% in each assessment element.

Assessment:

Indicative Assessment Tasks:

Assessment One: The learning outcomes will be assessed by a design exercise undertaken throughout the module which requires the student to interpret, specify, design, implement and evaluate test algorithms on a typical ATE system which is individually monitored and assessed.

Assessment Two: The learning outcomes will be assessed by an unseen 2 hour examination.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	4	Coursework	50		2000
2	1,2,3	Examination	50	2 hours	

Learning and Teaching Strategies:

The module will be delivered mainly through lead lectures and student-driven investigative work. About one third of the content is to be achieved through individual study. The study time will be made up from formal lectures, small group tutorials and individual study but also with programmed access to lab/computer facilities, for directed practical and analysis activities. It is expected that regular tutorial sessions will be undertaken in the Laboratory to monitor current achievements, guide future progress, and challenge student expectations.

Also there will be extensive use of VLE (Moodle) for additional support and formative work outside of timetabled contact periods.

Syllabus outline:

Testing methodology: Design cycle, definition of test strategy and use of manual, automatic and semi-automatic test implementations, analysis of design, manufacturing, random and end of life faults. Design of structured testing algorithms for circuits and systems, Test pattern Generation and minimal algorithms, fault location algorithms, dictionaries and guided probe techniques.

Designing for testability: Principles, integration of test considerations into the design cycle, reliability and maintainability considerations. Testability measures and investigation into good practices. Relevance to QA and QC. Costs and penalties

Parametric analysis: Derivation of design limits, test limits, use of tolerance tiering, statistical analysis of production data, trend analysis and monitoring techniques.

Signal Integrity: Signal monitoring and interfacing, noise, transients and unwanted signals, transmission line effects, analysis and prediction of signal distortions for high speed devices. Overcoming metastability, PCB design principles for EMC compliance.

Indicative Bibliography:

Essential reading

Angus, R.B. and Hulbert, T.E. (2005) *VeePro: Practical Graphical Programming*. London: Springer.(ISBN: 978-1-85233-870-1)

Other indicative reading

Malvino, A. and Bates, D. (2015) *Electronic Principles*. 8thEdn. Boston: McGraw-Hill Higher Education.

Because of the fast changing nature of the Test & Design industry, text books tend to be focused on principles rather than specifics so are not updated as often as might be expected. Students are encouraged to identify current developments by reference to on-line resources. Some current examples may be found from:

<http://www.keysight.com>

<http://www.hp.com>

<http://www.wayne-kerr.co.uk>

<http://www.tek.com/>

<http://www.teradyne.com>

www.techonline.com

<http://www.IET.org.uk>

<http://www.bksv.com/>

<http://www.epn-online.com/>

<http://www.cieonline.co.uk/>