

**MODULE SPECIFICATION FORM**

Module Title: <b>Design for Electronics Manufacture and Testing</b>	Level: 7	Credit Value: 20
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Module code: ENG751	Cost Centre: GAEE	JACS3 code: H640
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Trimester(s) in which to be offered: T2	With effect from: September 2015
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<b>Office use only:</b> To be completed by AQSU:	Date approved: September 2015 Date revised: - Version no: 1
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Existing/New: New	Title of module being replaced (if any): ENGM13 Design for Electronics Manufacture and Testing
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Originating School: Applied Science, Computing & Engineering	Module Leader: Barrie Birmingham
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Module duration (total hours): 200 hrs	Status: core/option (identify programme where appropriate): Core
Scheduled learning & teaching hours: 40 hrs	
Independent study hours: 160 hrs	
Placement hours: 0 hrs	

Programme(s) in which to be offered: MSc Electronic Engineering	Pre-requisites per programme (between levels):
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**Module Aims:**

To have critical awareness of the interrelationships of test and design within the design and manufacturing cycle for modern electronic products, by extending the student 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**

Knowledge and understanding:

On completion of this module, the student should be able to:

1. Critically evaluate complex designs to establish the optimum test methodologies, synthesising minimal test algorithms for efficient and effective test strategies.
2. Specify, design and select appropriate technology Automatic test equipment and software, for One application, showing an understanding of cost effectiveness, sustainability, and life cycle analysis.
3. Design and implement an automated test solution, showing originality and self-direction in implementing test algorithms to functionally test a design to a professional standard.

Transferable/Key Skills and other attributes:

1. Written, oral and media communication skills
2. Leadership, team working and networking skills
3. Opportunity, creativity and problem solving skills
4. Information technology skills and digital literacy
5. Information management skills
6. Research skills
7. Intercultural and sustainability skills
8. Career management skills
9. Learning to learn (managing personal and professional development, self-management)
10. Numeracy

**Assessment:**

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.

*Please note that a derogation from academic regulations is in place for this module for students on all MSc programmes listed above; students are required to achieve an overall module mark of at least 50% with a minimum mark of 40% in each assessment element.*

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

**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. Where appropriate, guest lectures and seminars with invited researchers and industrialists will also be incorporated.

**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, TPG 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.

**Advanced test features:** Overview: use of VLSI / Mixed signal / LV and low power devices and testing, e.g. Boundary Scan, BILBO, etc. Self test, and comparison of algorithmic-based techniques with knowledge-based, heuristic and stochastic systems; suitability for ATE

**Current developments:** Investigation and review of current developments within the test and design field. Attendance at suitable seminars, guest speakers (researchers, KTP associates), and review of manufacturer's web based literature and software etc.

**Applications:** Identification and resolution of problems during complex system integration (e.g. aircraft avionics system) and test considerations, safety, cost, timescales. Case studies. Identification of parametric, functional and test anomalies. Interaction between sub-modules, rework and retest etc. Feedback to design and manufacturing stages.

## **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:**

Because of the fast changing nature of the Test & Design industry, text books tend to be focussed 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.techonline.com)

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

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

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

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

### **Indicative text books relevant to the module:**

Girard, P., Nicolici, N. and Wen, X. (Eds.) (2009) *Power-Aware Testing and Test Strategies for Low Power Devices*. New York: Springer.

Wunderlich, H.-J. (Ed.)(2009) *Models in Hardware Testing*. London: Springer.

Lawday, G., Ireland, D. and Edlund, G. (2008) *A Signal Integrity Engineer's Companion: Real-time Test and Measurement and Design Simulation*. Upper Saddle River, NJ: Prentice Hall.

Roberts, G.W., Taenzler, F. and Burns, M. (2012) *An Introduction to Mixed-Signal IC Test and Measurement*. New York: Oxford University Press.

IET Computers & Digital Techniques      Monthly Journal

IET Circuits, Devices & Systems      Monthly Journal

Engineering & Technology      Monthly Journal

Module Specification Form. Uploaded by: Husnullah Pangeran. Enabling Legislation and Effective Regulation should be in place before any form of water services provision is in operation, particularly where the private sector is involved. Development of International Law in the water sector Attempts at regulating (development of legal instruments) the water sector; treaties, conventions and other sources of international law The eCTD Backbone Files Specification for Module 1. of the first submission to each new regulatory activity. The form element is further described in section VI.B. M1 Forms and the form types with their designated reference locations are referenced in Table 10.3 For all form leaflets referenced in the form element or Module 1 heading element, the attribute of form-type is required and indicates the type of form being referenced and submitted. Communicate effectively in written form. Enhance IT and communications technology skills. Develop application of numbers. Assessment will be summative in the form of 2 written (1500) word assignments based on a choice of relevant data sets: Students will be given a data set for a quantitative study and asked to analyse the findings and produce a short research report including literature review and critique of the methodology and methods employed. module specification A precise statement of the effects that a software module is required to achieve. It can be employed both by the implementer of the module, since it gives a definitive statement of the requirements that are imposed on the module, and by users of the module, since it gives a precise statement of what the module provides. A good module specification makes no commitment as to how the module's effects are achieved. A variety of techniques have been developed for module specification.