

Course Description

7050 - Microelectronic Testing and Design for Test

Course Code:	ELEC ENG 7050
Course Title	Microelectronic Testing and Design for Test
Academic Year:	2008
Semester:	2
Units:	3
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Aims:

The aims of the course are to introduce

- the principles of digital and mixed signal semiconductor testing and Design for Test
- the advanced techniques of testing such as embedded core testing and mixed-signal Built-In Self-Test.

Outcomes:

On completion of this course students should be able to:

- place the test at the start of the design process;
- recognise the failure mechanisms and their fault models;
- distinguish between test and verification;
- anticipate the manufacturing test issues of a new design;
- include a test strategy in a design;
- envisage the modification of an existing design to make it better testable;
- develop new test strategies for digital or mixed-signal circuits or systems.

Previous Studies:

A reasonable understanding of the VLSI and integrated electronic systems is required.

Delivery Methods:

Teaching will be conducted in September in 5-day duration. Five lecture topics are devoted to basic testing and techniques and five topics cover the advanced testing.

Assessment:

There will be two tests of 120 mins each during the September teaching weeks. Each test contributes to 10% of final mark.

Exam to be held in November, contributing 80%.

Course Outline:

Basic test approaches. Economics and role of testing.

Fundamentals of Automatic Test Equipment.

Defects in CMOS technology, fault models and fault simulation.

Automatic Test Pattern Generation.

Parametric testing, functional & structural tests.

Ad-hoc Design for Test rules.

Boundary-scan test for systems and boards.

Scan Path Testing Techniques.

Logic Built-In Self Test and data compaction techniques to reduce test time for digital circuits.

Mixed-signal system and board testing and the analog boundary-scan test approach.

Modelling of the analog faults for the semiconductor manufacturing.

Mixed-signal testing using automatic test equipment and techniques for reducing the test complexity.

Testing A/D and D/A using DSP, waveform generators and digitisers.

Reference Books

Laung-Terng Wang, Cheng-Wen Wu and Xiaoqing Wen: VLSI Test Principles and Architectures (Design for Testability). (ISBN: 0-12-370597-5)

http://www.elsevier.com/wps/find/bookdescription.cws_home/707926/descrip

Keith B. Schaub and Joe Kelly: Production Testing of RF and System-on-a-Chip Devices for Wireless Communications. (ISBN 1-58053-692-1)

<http://www.artechhouse.com/default.asp?Frame=Book.asp&Book=1-58053-692-1>

Michael L. J. Bushnell, Vishwani D. Agrawal (2000), Essentials of Electronic Testing for Digital, Memory, and Mixed-Signal VLSI Circuits, Boston, Kluwer Academic Publishers

Parag K. Lala (1997), Digital Circuit Testing and Testability, New York, Elsevier Science and Technology Books

Alfred L. Crouch (1999), Design-For-Test For Digital IC's and Embedded Core Systems, New Jersey, Pearson Education, Prentice Hall Modern Semiconductor Design Series

Manoj Sachdev (1999), Defect Oriented Testing for CMOS Analog and Digital Circuits, Boston, Kluwer Academic Publishers, Frontiers in Electronic Testing Series
IEEE Design & Test of Computers, IEEE Computer Society , <http://computer.org/dt>

Graduate Attributes

- GA1 An advanced level of knowledge and understanding of the theory and practice of Electrical and Electronic, Computer Systems or IT&T Engineering and the fundamentals of science and mathematics that underpin these disciplines.
- GA3 The ability to apply knowledge in a systematic and creative fashion to the solution of practical problems.
- GA7 An ability to identify, formalise, model and analyse problems.
- GA8 The capacity to design, optimise, implement, test and evaluate solutions.
- GA9 An ability to plan, manage and implement solutions that balance considerations of economy, quality, timeliness and reliability as well as social, legal and environmental issues.
- GA10 Personal attributes including: perseverance in the face of difficulties; initiative in identifying problems or opportunities; resourcefulness in seeking solutions; and a capacity for critical thought.
- GA11 Skills in the use of advanced technology, including an ability to build software to study and solve a range of problems.
- GA13 An ability to utilise a systems approach to design and operational performance.

These programs also foster the graduate attributes of the University of Adelaide and the Institution of Engineers Australia. These should be read in conjunction with the list above.

Assessment of Graduate Attributes

The examination will assess attributes GA1, GA7, GA8, GA11 and GA13. The tests and tutorials are designed to develop and assess GA1, GA3, GA7, GA8, GA9, GA10, GA11 and GA13.