Liverpool John Moores University

Title:	IC DEVICES, FABRICATION AND TESTING
Status:	Definitive
Code:	**7002ENG** (105346)
Version Start Date:	01-08-2016
Owning School/Faculty:	Maritime and Mechanical Engineering
Teaching School/Faculty:	Maritime and Mechanical Engineering

Team	Leader
Jian Zhang	Y

Academic Level:	FHEQ7	**Credit Value:**	20	**Total Delivered Hours:**	38
Total Learning Hours:	200	**Private Study:**	162		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	24
Practical	6
Tutorial	6

Grading Basis: 50 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	2 hour exam	70	2
Report	AS2	1 coursework	30	

Aims

To develop an understanding of the state-of-the-art CMOS devices and systems.
To gain knowledge in the fabrication and testing of microelectronic devices.
To enhance knowledge in latest consumer electronic products.

Learning Outcomes

After completing the module the student should be able to:

1	Demonstrate a knowledge of the theory and problems of advanced microelectronic devices
2	Have a high level of knowledge in MOS fabrication process and techniques
3	Discern testing techniques and appreciate reliability issues
4	Use simulation software for device and fabrication process modelling

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

EXAM	1	2	3
Report	1	2	4

Outline Syllabus

An overview of the history of microelectronic industry and the milestones in the theory of microelectronic devices

Advanced microelectronic devices and systems: submicrometer MOSFETs, FINFETs, non-volatile memories, SOI transistors and thin film transistors (TFTs), and nano-wire devices. Liquid Crystal Display (LCD) systems and Charge-Coupled Devices (CCDs) cameras. Short-channel effects: charge sharing effects, drain induced barrier lowering and gate induced leakage current. New materials for metals, gate dielectrics, and semiconductors.

Fabrications: typical MOS process flow and techniques, wafer cleaning, deposition (CVD and PECVD), masks and lithography, ion implantation, metallization, oxidation, epitaxy, dry etching (plasma and reactive ions), isolation techniques, and device variabilities.

Testing and reliabilities: typical procedure and techniques, time-dependent dielectric breakdown (TDDB) and stress-induced-leakage-currents (SILC), Fowler-Nordheim injection, interface states and space charges in the oxide, the high and low frequency differential capacitance-voltage techniques, hot carrier induced degradation, bias temperature instabilities, lifetime prediction.

Learning Activities

Lectures supported by handouts & tutorials where appropriate.
Practical sessions will use software packages for device and fabrication process modelling.
An individual student report is required for the coursework.

Notes

This level 7 module extends a prospective student's knowledge of the state-of-the-art electronic devices and systems. The emphasis is on the differences between an advanced device and a traditional one. The fabrication, testing and reliability issues will be addressed.