

Module Information

2022.01, Approved

Summary Information

Module Code	7405ELE
Formal Module Title	Nano Devices, Fabrication and Testing
Owning School	Engineering
Career	Postgraduate Taught
Credits	20
Academic level	FHEQ Level 7
Grading Schema	50

Teaching Responsibility

LJMU Schools involved in Delivery
Engineering

Learning Methods

Learning Method Type	Hours
Lecture	22
Tutorial	22

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
JAN-CTY	CTY	January	12 Weeks

Aims and Outcomes

Aims	To develop an understanding of the latest development and challenges encountered by the microelectronic industry. To gain knowledge in the fabrication and testing of microelectronic devices. To enhance knowledge in latest consumer electronic products.
------	---

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Analyse the performance of latest consumer electronic products
MLO2	2	Critically appraise MOS fabrication process and techniques
MLO3	3	Critically evaluate testing techniques and appreciate reliability issues

Module Content

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, NOR and NAND Flash memories, 3D memories, SRAM and DRAM, 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.
Module Overview	
Additional Information	General 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 encountered by industry will be addressed. UNESCO Sustainable Development Goals Good Health and Wellbeing Quality Education Decent Work and Economic Growth Industry, Innovation and Infrastructure Responsible Consumption and Production Climate Action Partnerships for the Goals UK SPEC AHEP 4CEng. M1 Apply a comprehensive knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Much of the knowledge will be at the forefront of the particular subject of study and informed by a critical awareness of new developments and the wider context of engineering. M2 Formulate and analyse complex problems to reach substantiated conclusions. This will involve evaluating available data using first principles of mathematics, statistics, natural science and engineering principles, and using engineering judgment to work with information that may be uncertain or incomplete, discussing the limitations of the techniques employed. M4 Select and critically evaluate technical literature and other sources of information to solve complex problems. M5 Design solutions for complex problems that evidence some originality and meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health and safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards M6 Apply an integrated or systems approach to the solution of complex problems.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Centralised Exam	Exam	100	3	MLO1, MLO2, MLO3

Module Contacts

