ELEC4302 DIGITAL MICROELECTRONICS SYSTEM DESIGN 2009

Credit: 6 points
Old unit codes (to look up exams): 620.436, ENGT4302

Unit Coordinator and lecturer
John Dell, johnd@ee.uwa.edu.au

Lectures:
Tuesday 11.00 – 11.45 and 12.00 – 12.45 ENCM 2.45
Friday 9.00 – 9.45 ENCM 2.45

Tutorial:
Tuesday 15.00 – 15.45 ENCM 2.45

NOTE: All lectures and the tutorial are recorded and available via Lectopia (see unit web page for link)

Laboratories:
Use Linux Machines – done in your own time

Consultation Hours:
John Dell – Rm 1.68 when you can find him – but guaranteed Thursday 9 – 10.

Assessment:

In-class tests (x2) 20% (10% each) Tuesday 5 May (Devices)
Tuesday 5 May (Circuits)

Device assignment 10% Due 9am 27 April
Design assignment 10% Due 9am 25 May
Final examination 60%

Web Site: http://student.ee.uwa.edu.au/units/elec4302
Please read web site and email for up to date information
Outcomes: This unit develops in-depth technical competence in the design of CMOS digital integrated circuits and digital systems in general. It includes individual projects in MOSFET characterisation and in IC design. Students obtain a sound understanding of silicon integrated circuit technology, including both MOSFET device operation and the VLSI design methodology, and are able to apply their knowledge of electronics and engineering fundamentals in the design of CMOS integrated circuits and large-scale digital systems. Students also gain skills in the identification, formulation and solution of problems relating to the design of digital integrated circuits; learn to function effectively as individual designers or as members of a design team; develop documentation and report writing skills; and form a firm foundation for continued self-learning. In the design project, students achieve a level of competency in the use of computer-aided engineering (CAE) tools and a systems approach to design.

Content: This unit includes digital system implementation; custom and semi-custom integrated circuits; programmable logic devices; silicon CMOS fabrication process, design rules; structured design methodology, circuit and layout design, circuit extraction and design verification; performance estimation, transistor and gate sizing; static, dynamic and pre-charged logic; sub-system design; system partitioning, communication, timing, clock distribution, clock skew; MOS device physics including band structure and device characteristics; MOS capacitors; technology scaling, benefits and limitations; small geometry effects; sub-threshold effects; two-dimensional modelling, high-field effects, hot electron damage, reliability, and yield.

Assessment: This is based on a written examination, in-class tests and assignments. The written examination along with in-class tests assess students' understanding of the silicon integrated circuit technology, its potential and limitations, integrated circuit design techniques and systems approach to design. In-class tests also serve to provide feedback to students on their progress in the unit. Device assignments assess students' understanding of the practical aspects of device performance. Design assignments assess students' ability to apply their knowledge and problem-solving skills in a design situation, their understanding of the design methodology, their ability to use design and simulation tools, as well as their documentation and report writing skills.

Supplementary assessment is not available in this unit except in the case of a bachelor's pass degree student who has obtained a mark of 45 to 49 and is currently enrolled in this unit, and it is the only remaining unit that the student must pass in order to complete the course.

Prerequisites: ELEC2304 Physical Electronics 2
Advisable prior study: ELEC3301 Circuits and Electronic Systems 3 and ELEC2301 Digital System Design

Other information:
Student OS&H - http://www.safety.uwa.edu.au/students