The University Of Sheffield.

Electronic & Electrical Engineering.

EEE310 INTRODUCTION TO VLSI DESIGN

Credits: 10

Course Description including Aims

This course aims to bring the student to level of understanding of VLSI design, such that they can:

1. Understand the alternatives available to and constraints that act upon a VLSI designer.
2. Understand the underlying technologies, trends, and critical issues that affect and will affect VLSI design.

Outline Syllabus

Introduction: Technology development: historical perspective, trends, and future problems and issues. **Economics and Design Styles:** Economics of chip production. Economics of chip design. **Implementation options**: Full custom; cell based, Gate Arrays, FPGAs and Programmable Logic Devices. **Simulation:** Logic simulation. **Synchronous Design**: Methodology. Clocks and clocking. **Test**: Testing aims. Test techniques: Design for testability; structured approaches; scan path; signature analysis and BIST. JTAG. **Logic design**: CMOS technology and characteristics. Noise margins. Gate design/sizing. Switching speed. **Interconnect:** trends and problems. **Power consumption**: dynamic and static power; trends.

Time Allocation

24 lectures plus 12 hours of additional support material.

Recommended Previous Courses

Some previous knowledge of MOSFET operation is assumed, EEE118 Electronic Devices and Circuits would be appropriate. A familiarity with digital circuit design is essential, EEE117 Digital System Engineering provides a suitable background.

Assessment

2 Hour Examination

Recommended Books

Weste N & Eshragian K	*Principles of CMOS VLSI Design A Systems Perspective*	Addison Wesley
	Technology Roadmap for Semiconductors 2001	http://public.itrs.net
Uyemura J P	*Introduction to VLSI Circuits and Systems*	Wiley
Smith M J S	*Application-Specific Integrated Circuits*	Addison Wesley
Rabaey J	*Digital Integrated Circuits - A Design Perspective*	Prentice Hall
Geiger R L, Allen P E & Strader N R	*VLSI Design Techniques for Analog and Digital Circuits.*	McGraw Hill

Objectives

By the end of this unit successful students will be able to:

1. Demonstrate an understanding of the costs, options, technological difficulties, and benefits of VLSI for particular applications;
2. Calculate the costs (to a first order) of a VLSI design;
3. Use the appropriate terminology associated with VLSI;
4. Outline the VLSI design process and the methodologies used in system implementation;
5. Design simple logic gates based on an understanding of the required logic and the behaviour of the technology. Students should also be able to estimate the performance of these gates (power, speed, area).