The University Of Sheffield.

Electronic & Electrical Engineering.

EEE6208 ADVANCED INTEGRATED ELECTRONICS

Credits: 15

Course Description including Aims

This course advance students' understanding of analogue and digital VLSI design, such that they can:

1. Understand the issues that define the limits of what is possible using VLSI.
2. Understand techniques that will allow circuits to be analysed from a variety of perspectives.
3. Design multistage VLSI signal amplifiers & model their performance using SPICE
4. Design D to A and A to D converters.

Outline Syllabus

Test: Testing aims. Test techniques: Design for testability; structured approaches; scan path; signature analysis and BIST. JTAG. **Interconnect:** trends and problems. **Power consumption**: dynamic and static power; trends. **Non-CMOS Logic:** Dynamic logic, Pass-Transistor Logic. **Circuit Layout:** standard CMOS processing. **Amplifiers:** review of 2 stage op-amp design. Folded cascode op-amps, feedback, frequency response. **SPICE:** using high level MOSFET models. **Converters:** mixed signal systems, principles of DAC and ADC operation.

Time Allocation

36 lectures plus 12 hours of additional support material.

Recommended Previous Courses

EEE335 or EEE348.

Assessment

2 Hour Examination 3/4 questions + 45 minute intermediate assessment during S1

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. Understand the importance of interconnect as a limit to performance and the effect that it has on power consumption;
2. Calculate the power consumption of circuits and be able to estimate the performance of larger systems;
3. Understand the importance of testing and testability and be able to devise testing strategies for circuits;
4. Design dynamic and pass-transistor 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).
5. Design a CMOS folded-cascode op-amp and use realistic SPICE MOSFET models to assess its performance.
6. Analyse the frequency response and assess the stability of a range of amplifier designs.
7. Use feedback to stabilise amplifier circuits.
8. Design DAC and ADC circuits and model their performance using SPICE.