



The  
University  
Of  
Sheffield.

Electronic &  
Electrical  
Engineering.

## EEE331 ANALOGUE ELECTRONICS

**Credits:** 10

### Course Description including Aims

This course aims to describe the generic circuit elements and their associated properties which are typically used within IC circuits.

Additionally, this course aims to deliver the competence of analyzing and designing analogue VLSI circuits and systems. The scope of this course is driven by the need of analogue or analogue-mixed VLSI solutions in telecommunication or wireless. It includes the fundamentals of operational amplifiers and various analogue VLSI filters.

### Outline Syllabus

Circuit operating characteristics of BJTs and MOSFETs, single transistor circuit elements. Two transistor circuit elements. Differential amplifiers, current mirrors and output stages.

CMOS operational amplifier, analogue VLSI design, leapfrog structure for LC ladder filter, signal flow graph, active RC filter, switched capacitor filter, GmC filter.

### Time Allocation

20 lectures.

### Recommended Previous Courses

EEE101 Circuits and Signals  
EEE103 Analogue Circuits  
EEE204 Electronic Devices in Circuits  
MAS242 Mathematics III (Electrical)

### Assessment

2 Hour Examination, answer 3 questions from 4

### Recommended Books

Gray, PR et al *Analysis and Design of Analogue Integrated Circuits* (Wiley)  
Millman *Microelectronics,* (McGraw Hill)

## **Objectives**

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

1. Write down and use the high frequency equivalent circuit of a circuit to calculate high frequency behaviour.
2. Understand the mode of operation, particular advantages and disadvantages of commonly used IC circuit building blocks.
3. Design simple IC structures to achieve specific goals.
4. Identify those parts of a circuit that play a major role in limiting the frequency response.
5. Understand design issues of VLSI operational amplifiers and analyze analogue circuits for CMOS operational amplifiers.
6. Understand the analogue VLSI filter design methodology, with the aid of leapfrog structure and the signal flow graph analysis.
7. Design an analogue filter in various implementation methods of active RC filter, switched capacitor filter and GmC filter.