



The  
University  
Of  
Sheffield.

Electronic &  
Electrical  
Engineering.

## EEE6042 INTEGRATED CIRCUIT TECHNOLOGY

Credits: 10

### Course Description including Aims

This course aims to give students an understanding of semiconductor properties and processing, together with growth and characterisation methods. By the end of this course students should understand the principal device processing steps and the way in which they are implemented to produce simple device structures.

### Outline Syllabus

Historical perspective and overview. **Properties of Semiconductors** : basic electrical, optical and structural characteristics including impurity effects, the Miller index notation and crystal defects. **Bulk Crystal Growth** : preparation of bulk Si and GaAs ingots and slices; Czochralski, floating zone, LEC and Bridgman growth. **Epitaxial Layer Growth** : CVD, MOCVD and MBE methods. **Semiconductor Characterisation Methods** : TEM, SEM, X-rays, SIMS. **Oxidation and Etching** : dry, wet and deposited layers. **Lithography** : optical and e-beam methods, mask alignment. **Ion Implantation** : equipment, ion damage, annealing, dopant diffusion. **Gettering** : internal, external. **Metallization and Silicides** : metal deposition, ohmic contact and interconnect formation. **Device Processing Integration** : CMOS and bipolar device fabrication with resistors and capacitors, device packaging, failure and reliability issues.

### Time Allocation

24 lectures plus 12 hours of additional support material.

### Recommended Previous Courses

EEE207 "Semiconductor Electronics and Devices"

### Assessment

2 hour examination.

### Recommended Books

James W Mayer and S S Lau	Electronic Materials Science for Integrated Circuits in Si and GaAs	Macmillan
R A Strading and P C Klipstein	Growth and Characterisation of Semiconductors	IOP Publishing
P E J Flewitt and R K Wild	Physical Methods for Materials Characterisation	IOP Publishing
S M Sze	VLSI Technology	McGraw-Hill
S A Campbell	Science and Engineering of Microelectronic Fabrication	Oxford
S M Sze	Semiconductor Devices: Physics and Technology	Wiley

## **Objectives**

By the end of the module, successful students will be able to

1. Demonstrate good understanding of the properties and preparation of semiconducting materials.
2. Display knowledge of modern device processing practices.
3. Design a process flow to produce a simple device.