

ENG EC578 Fabrication Technology for Integrated Circuits

2008-2009 Catalog Data:

Presentation of fabrication procedures for silicon integrated circuits: physical properties of bulk silicon; silicon processing such as oxidation, diffusion, epitaxy, deposition, and ion implantation; silicon crystallography, anisotropic etching, photolithography and chemical and plasma techniques. The limitations these processes impose on the design of bipolar and MOS devices and integrated circuits are discussed. Design of an integrated circuit and the required processing.

Status in the Curriculum: Elective

Class/Lab Schedule:

Lecture/Lab: 4 hours/week

Textbooks and other required materials:

R.C.Jaeger, Introduction to Microelectronic Fabrication, 2nd Edition, 2002.

References: S.K. Gandhi, VLSI Fabrication Principles, 2nd Edition, 1996

Coordinator: Vladimir Kleptsyn, ECE

Prerequisites by topic:

ENG EC410 – Introduction to Electronics

Goals:

To educate students in fabrication techniques of integrated circuits and to give them the laboratory experience they need to process wafers.

Course Outcomes:

As an outcome of completing the course students should:

- 1) Understand silicon processing technological operations;
- 2) Understand photolithography and masking
- 3) Design masks, photolithographic processing and layer structure
- 4) Possess skills in silicon wafers processing

Course Outcomes mapped to Program Outcomes:

Program:	a	b	c	d	e	f	g	h	i	j	k
Course:	1	1-3	1	1	1-4			1		1	4
Emphasis:	4	5	4	2	4			2		4	5

1=not at all; 5=a great deal;

Topics to be discussed during lecture sessions:

1) Crystal structures, Muller indices, vacancies, interstitials. 2) Impurities, bandgap, mobility, dependence on doping. 3) Resistivity, solid solubility, interstitial, substitutional diffusion. 4) Fick's Laws, 1st and 2nd. 5) Diffusion from constant source and amount, predep, drive-in. 6) Two-step diffusion process, boron, phosphorous, arsenic diffusion. 7) Junction depth, oxidation kinetics, linear, parabolic, wet, dry oxidation. 8) Ion implantation, damage, annealing. 9) Photolithography, cleaning, photoresist, developing. 10) Device fabrication, BJT, MOSFET.

Contribution of Course to Meeting the Professional Component:

Engineering topics: 100%

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