E&CE 631 Microelectronic Processing Technology

Instructor   :   C. R. (Selva) Selvakumar
Office   :   ▮▮▮▮▮▮ , Phone: x 33978
e-mail   :   selvakum@uwaterloo.ca

This course will offer an introduction to the principles and practices of fabrication of integrated circuits and the evolving nanoelectronic technology. Major emphasis will be on unit processes of silicon technology although several aspects of GaAs and III-V compound technologies such as MBE and MOCVD and possibly other compound semiconductor technologies and organic semiconductor technologies will also be covered. Topics to be covered in this course are:

1. Overview of Semiconductor IC Process technologies.
2. Crystal growth (Czochralski, Float Zone, polishing, gettering, challenges)
3. Oxidation (kinetics, Deal-Grove model, rate constants, high pressure oxidation, dopant effects, two & three dimensional effects, defects)
4. Deposition techniques (vacuum evaporation, sputtering, CVD, LPCVD)
5. Epitaxy (including MBE, MOCVD, CBE, UHV-CVD)
6. Diffusion (Fick's model, concentration dependent models, field effect, band-gap narrowing effect, anomalous effects)
7. Ion implantation (Ion stopping, range distributions, damage, annealing, high energy implants)
8. Rapid thermal annealing (if time permits)
9. Lithography (optical, e-beam and x-ray; resists)
10. Etching (wet chemical, dry reactive ion-etching, anisotropic etches, defect delineation)
11. Interconnect technology (some aspects if time permits)
12. Yield and safety issues and evolving strategies (cluster tool, microfactory etc) (if time permits)
13. Special topics: organic semiconductors

Reference Texts   :
1. James D. Plummer, Michael Deal and Peter Griffin. "Silicon VLSI Technolog: Fundamentals, practice and modeling", Prentice Hall, 2000, ISBN: 0130850373
2. W.R. Runyan and K.E. Bean, Semiconductor Integrated Circuit Processing Technology, Addison-Wesley 1990
3. S.K. Ghandhi, VLSI Fabrication Principles, John Wiley 1994
4. S.M. Sze, VLSI Technology, McGraw -Hill 1988
5. Journal articles and review articles

Lecture Hours and Hall   :   Please check Quest for details.
[http://www.adm.uwaterloo.ca/infocour/CIR/SA/grad.html]

Registration   :Please register in LEARN or
                                [http://ist.uwaterloo.ca/cs/learn/learn.html]
                                or send an e-mail to selvakumar@uwaterloo.ca
                                    indicating the following:
- the department in which you pursue your Graduate Program
- the name of your thesis advisor
- list the courses you have taken earlier in the area of semiconductor devices and technology, either in your Undergraduate or in Graduate program.
- state whether it is for credit