

E&CE 631 Microelectronic Processing Technology

Instructor : C. R. (Selva) Selvakumar
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This course will offer an introduction to the principles and practices of fabrication of integrated circuits. Major emphasis will be on silicon technology although several aspects of GaAs and other compound semiconductor technologies will also be covered.

Topics intended 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 (briefly if time permits)
9. Lithography (mostly optical, briefly e-beam and x-ray; resists)
10. Etching (wet chemical, dry reactive ion-etching, anisotropic etches, defect delineation)
11. (Only if time permits: Yield and safety issues and evolving strategies (cluster tool, microfactory etc)

Reference Texts :

1. [Fabrication engineering at the micro and nanoscale](#) Campbell, Stephen A., 1954-; Campbell, Stephen A., 1954-; Knovel (Firm) 2008 (available online in our library)
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 : Online for Winter 2021

Registration : Please 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.

Course Credit

- state whether it is for credit
- : 40% Final (48-hour take home exam), 10% (one or two assignments); 50% Project