NE 343 Microfabrication and Thin-film Technology

Held with: ECE 433 Fabrication technology for Micro & Nano Devices
Held with: ECE 730 Topics in Solid State Devices: Advance Technologies for Semiconductor Processing

University of Waterloo
Nanotechnology Engineering Program
Spring 2022

Lectures: ███████   ███████   ███████
               ███████   ███████   ███████
                         05/12, 05/26
                         06/09, 06/23
                         07/07, 07/21

Tutorials: ███████   ███████   ███████

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Course Content

This course provides an overview of various microfabrication technologies utilized in modern VLSI semiconductor fabrication. They are also widely utilized for other micro-devices such as MEMS, microfluidics, sensors, data storage (hard drive).

Topics:
1. Introduction to semiconductor devices and technology
2. CMOS fabrication process overview
3. Crystal growth, wafer fabrication
4. Clean room, wafer cleaning and gettering
5. Lithography
6. Thermal oxidation
7. Dopant diffusion
8. Ion implantation
9. Thin film deposition
10. Etching.

Note that these topics are in the same order as the textbook chapters. Most topics take ~1 week to cover; yet thin film deposition and etching will each take ~2 weeks.

Textbook

Plummer, Deal & Griffin, *Silicon VLSI Technology: Fundamentals, Practice, and Modeling,* Prentice Hall, 2000**.** (ISBN-10: 0130850373)

Note that this is a big book. But you shouldn't be scared by its size; since for most chapters we will cover only the first half or so of that chapter (i.e. we won't cover Models and Simulations very much).

Reference:

- Campbell, *Fabrication Engineering at the Micro and Nanoscale,* Oxford, 2008
  ISBN:9780195320176 (this is third edition)
  Second edition: *The Science and Engineering of Microelectronic Fabrication,* 2001

You are not encouraged to read the reference unless you have read and understand very well the textbook.

The textbook is much better written (clearer concept) than the reference, yet the reference is closer to textbook style (easier to read).

Course Web Site:

A course homepage will be available on UW LEARN.

Course Grading Criteria

- Assignment   **15 %**
- Two quizzes   **15 %**   (one before mid-term exam, one after)
- Midterm Exam   **20 %**
- Final Exam   **50 %**

For assignment, you must do it by yourself, as this will help you a lot for your mid-term and final exams.

For quiz, midterm and final exams, they are closed book. You are allowed to bring 1 page of letter-sized "cheat-sheet" writing on both sides for quiz, 2 pages for midterm, and 4 pages for final exams.

The "cheat-sheet" must be hand-written (no typing). It is OK to copy/paste your own hand-writing (this way you can re-use part of the cheat-sheets of mid-term exam for final exam).

For the exams, 60% problems will be concept, 20% calculation. The rest 20% can be anything (including concept and calculation).

Tutorials:

Tutorials will be used for solving problems of assignments/quizzes/exams, and for watching DVD "Silicon Run". I will also invite some former NE students/researchers/entrepreneurs…to give seminars on all kind of topics.