

**NE 343 Microfabrication and thin-film technology**  
**ECE 433 Fabrication technology for micro & nano devices**  
**ECE 730 Advanced technology for semiconductor processing**  
University of Waterloo  
Nanotechnology Engineering Program  
Spring 2021

**Lectures:** No live lecture, at least 2 online office hours per week

**Tutorials:** TA can give live tutorial to solve assignment/exam questions if there is the need

**Instructor:** **Dr. Bo Cui**

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**TAs:**

**Gabriel De Oliveira Silva (1.0 TA)**

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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). The technical content is not up to date (since the book was published in 2000). If you want to learn start-of-the-art fabrication technology, you should consider taking NE353 (*nanofabrication*), also taught by me, in the Fall term.

### **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 is available on UW LEARN.

### **Course Grading Criteria**

- Assignment 15%
- Project/presentation 15%
- Five quiz (best 4 counted) 40%
- Final Exam 30%

For assignment, you must do it by yourself (though you are allowed to talk to others to get some hint), as this will help you a lot for your quiz/exams.

The quiz/exam will be open book. You must do it all by yourself (cannot talk to others to get help).