NANYANG TECHNOLOGICAL UNIVERSITY

Course: EE3013 Semiconductor Devices and Processing

School: School of Electrical and Electronic Engineering

Course Overview

Faculty Information

This course is divided into two parts:

PART I – TAY BENG KANG

PART II – ZHANG DAO HUA

Our contacts

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Faculty: Prof Zhang Dao Hua
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Course Assessment

Continuous Assessment

- Quiz 1 — 10%
- Quiz 2 — 10%
- Homework assignment — 10%
- Lab module inclusive of a short lab quiz — 10%

Final Examination — 60%

Course Assessment

Continuous Assessment	**When**	**Format**
• Quiz 1	Week 6	MCQs
• Quiz 2	Week 10	MCQs
• Homework assignment	Week 10-13	Report
• Short lab quiz	Week 11	MCQs

Final Examination		
Four questions, 2 for each part	TBD	Closed book, formula list in appendix

NANYANG TECHNOLOGICAL UNIVERSITY

Video Lessons, Lecture Notes, and Tutorial Questions are available in NTULearn!

How to access the LAMS learning activities of the course:

1. Login to NTULearn (**https://ntulearn.ntu.edu.sg**).
2. After you login, you will be directed to 'My Courses'
3. click the course link: **21S2-EE3013-C-TUT: EE3013-SEMICOND DEV & PROCESSING (TEL)**
4. Clink "Contents", you can find the week wise folders.
5. Select the week folder, you can find the followings:

   Lecture notes

   Practice problems

   LAMS

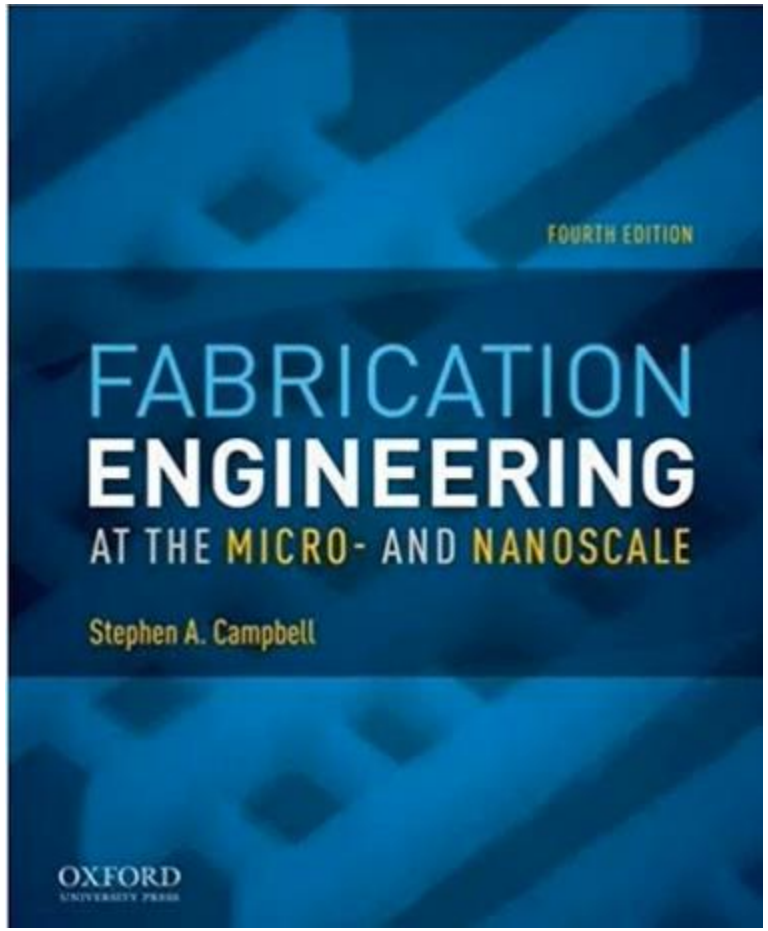
Course Information

You are **expected** to view the LAMS video lessons and attempt all tutorial questions for that week prior to attending the tutorial class.

Textbooks and References

References

1. Michael Quirk and Julian Serda, "Semiconductor Manufacturing Technology", Prentice Hall, 2003 (TK7836.Q93)
2. S. M. Sze, 'Semiconductor Devices Physics and Technology", John Wiley & Son, Inc. 2001 (TK7871.85.S9883)
3. D. A. Neamen, Semiconductor Physics & Devices – Basic Principles, 4th Ed., McGraw Hill, 2011
4. Fabrication engineering at the micro- and nano-scale, Stephen Campbell, Oxford 2012



Course Objectives

At the end of this course, you should be able to:

A. Semiconductor Processing

- Describe the key process modules for the fabrication of silicon-based integrated circuits.
- Explain the basic concepts, mechanisms, and the applications in IC fabrication processes, tool sets, and characterisation techniques. The key process modules include:
  - Lithography
  - Dry and Wet Etching Techniques
  - Thin film Deposition Techniques
  - Oxidation
  - Thermal Diffusion
  - Ion-Implantation

B. Semiconductor Devices

- Review PN junction diode theory and operation mechanisms.
- Explain transistor action and device characteristics of bipolar junction transistor (BJT).
- Explain the basic concepts of Metal-Oxide-Semiconductor (MOS) diode such as energy-band diagram and effect of bias voltage, and MOS capacitors.
- Explain transistor action and device characteristics of MOS Field-Effect-Transistor (MOSFET).

C. Lab Tour (Virtual) to Clean Room

- Explain the clean room environment and safety protocols.
- Describe the fabrication tools and procedures for semiconductor device fabrication.

Topics Covered in Part I

Week	Topics Covered
1	Introduction to Semiconductor Processing + Lithography Processing
2	Lithography Technology+ Resist Technology + Advanced Technology
3	Wet Etching
4	Dry Etching
5	Physical and Chemical Vapour Deposition
6	Quiz

Topics Covered in Part II

Week	Topics Covered
7	Thermal Oxidation
8	Thermal Diffusion
9	Ion Implantation
10	Quiz
11	PN Junction Diodes
12	Bipolar Junction Transistors
13	MOS Devices