

FALL 2020

ECE 8050 T01 – Advanced VLSI Materials, Devices and Technology

COURSE DESCRIPTION:

This course will cover semiconductor device fabrication with a focus on CMOS technology. State of the art devices and fabrication techniques will be included. Finally, a discussion of “beyond” CMOS will include future devices that would include organic, spin-based, and quantum devices

COURSE OBJECTIVE:

To obtain an understanding of modern microelectronic devices and the methods by which they are fabricated

PRE-REQUISITES:

A basic knowledge of physical electronics will be required along with the permission of the instructor.

CONTACT HOURS:

3 hours, once per week

COURSE CONTENT:

The following topics will be discussed:

- Very Large Scale Integration (VLSI) - Overview
- Review of basic Metal-Oxide-Semiconductor (MOS) theory
- Charge and Capacitance in MOS devices
- Review of VLSI Processing
- Basic MOS Devices - semiconductors, bands (conduction/valence), FETs etc.
- Advanced MOS devices - Shrinking device dimensions, short channel effects, quantum devices, etc.
- The CMOS gate stack (Front-end-of-the-line) - advances
- How to design a silicon chip
- Additional advanced research topics as determined by the instructor.

HOMEWORK:

2 projects and 2 seminars will be required for all students.

TEXTBOOK:

Fundamentals of Modern VLSI Devices, 2nd Edition, Yuan Taur and Tak H. Ning
ISBN 978-0-521-83294-6, Cambridge University Press, 2009

GRADE ANNOUNCEMENTS:

TBA – Due to COVID-19, this date to be announced by the Registrar’s Office

EVALUATION:

The final course grade is determined by your performance in seminars, written projects and a final examination. The weighting of each of these components is as follows:

COMPONENT	NO	VALUE %	TOTAL VALUE	DETAILS / ADDITIONAL INFO
Seminars	2	10 % each	20%	
Written projects	2	20 % each	25 %	
Final Examination	1	50%	50 %	
TOTAL			100 %	

GRADE SCALE:

LETTER	MARK	LETTER	MARK	LETTER	MARK	LETTER	MARK
A+	95-100	B+	80-84	C+	65-69	D	45-54
A	85-94	B	70-79	C	55-64	F	<45

INSTRUCTOR INFO:

Name: Prof. Douglas Buchanan
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Email: douglas.buchanan@umanitoba.ca
Office Hours: By appointment

VOLUNTARY WITHDRAW:

November 23, 2020

REQUIREMENTS/REGULATIONS

Student Responsibilities: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and his/her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with, among others, incomplete term work, deferred examinations, attendance and withdrawal, etc.

Lectures: Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- Examinations, assignments, laboratory reports, term exams, etc.
- A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty. Please refer any questions regarding Academic Integrity to your course instructor.

***Plagiarism:** to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source