University of Manitoba

Department of Electrical & Computer Engineering
Graduate Course Outline

FALL 2021

ECE 8050 – Topics in Microelectronics: Advanced VLSI Materials, Devices and Technology (Fall 2021)

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:
2-hours once per week

COURSE CONTENT:
The following topics will be discussed:

- VLSI - Overview
- Review of basic MOS theory
- Charge and Capacitance in MOS devices
- VLSI Processing (review)
- Basic MOS Devices - semiconductors, bands (conduction/valence), FETs etc.
- Advanced MOS devices - Shrinking device dimensions, short channel effects etc.
- The CMOS gate stack (FEOL) - advances
- How to design a silicon chip ….

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
IBSN 978-0-521-83294-6, Cambridge University Press, 2009

GRADE ANNOUNCEMENTS:
Grades for this course will be announced by January 2022

EVALUATION:

Your final course grade is determined by your performance in assignments, term test, and a final examination. The weighting of each of these components is given below. Students must receive a minimum of 50% on the final examination and must complete and pass all components in the course in order to be eligible to receive a passing grade.

Component values and grade scale are as follows:

COMPONENT	NO	VALUE %	TOTAL VALUE
Seminars	1	10 %	10 %
Project Report	1	15 %	15 %
Chip Design	1	25%	25%
Final	1	50 %	50 %
TOTAL			100 %

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: ..... Douglas. A. Buchanan
Office: ..... E2-453 EITC
Tel:..... (204) 474-9085
Email: ..... Douglas.Buchanan@umanitoba.ca

Office Hours:..... By appointment

VOLUNTARY WITHDRAW:

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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

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