ECE 8050 – Topics in Microelectronics
Advanced VLSI Materials, Devices and Technology

COURSE OUTLINE – FALL 2015

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:
1) VLSI - Overview
2) Review of basic MOS theory
3) Charge and Capacitance in MOS devices
4) VLSI Processing (review)
5) Basic MOS Devices - semiconductors, bands (conduction/valence), FETs etc.
6) Advanced MOS devices - Shrinking device dimensions, short channel effects etc.
7) The CMOS gate stack (FEOL) - advances
8) Beyond CMOS - eg. single electron devices, spin devices, organic devices

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

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

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 as follows:

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<th>COMPONENT</th>
<th>NO</th>
<th>VALUE %</th>
<th>TOTAL VALUE</th>
<th>DETAILS / ADDITIONAL INFO</th>
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<tr>
<td>Seminars</td>
<td>2</td>
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<td>Homework/Assignments</td>
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<td>Project</td>
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<td>Midterm Exam</td>
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<td>Final Examination</td>
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<td>TOTAL</td>
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INSTRUCTOR INFO:
Name: Prof. Douglas Buchanan
Office: E3-453
Tel: (204) 474-9085
Email: Douglas.Buchanan@umanitoba.ca

Office Hours: By appointment

VOLUNTARY WITHDRAW:
Wednesday, Nov. 18, 2015

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 about his or her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with incomplete term work, deferred examinations, and attendance and withdrawal.
  - **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.

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