EE-612: Nanoscale Transistors
Fall 2006

Professor Mark Lundstrom
Electrical and Computer Engineering
Purdue University, West Lafayette, IN USA
765-494-3515
lundstro@purdue.edu
evolution of silicon technology

Bell Labs, 1947

- gate oxide: \( \text{SiO}_2 (1-2\text{nm}) \)
- channel: (~ 30nm)
course outcomes

After taking this course, students should:

» Understand nanoscale MOSFET device physics

» Appreciate how device performance affects circuits and systems

» Appreciate device scaling challenges

» Be acquainted with new material and device approaches
course prerequisites

» Introductory level understanding of semiconductor physics and devices as well as basic electronic circuits.
(EE255 and EE305/606 at Purdue)

(basic MOS physics, devices, and CMOS circuits will be briefly reviewed)
course outline

**Part 1:** MOSFET fundamentals
5 weeks including 1 exam

**Part 2:** Short channel MOSFETs and CMOS Circuits
5 weeks including 1 exam

**Part 3:** Beyond the bulk silicon MOSFET
5 weeks
Fundamentals of Modern VLSI Devices
Yuan Taur and Tak Ning

supplemented with class notes

Cambridge Univ. Press, 1998
www.cup.cam.ac.uk/
# course grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1:</td>
<td>25%</td>
</tr>
<tr>
<td>-MOSFET fundamentals</td>
<td></td>
</tr>
<tr>
<td>Exam 2:</td>
<td>25%</td>
</tr>
<tr>
<td>-short channel MOSFETs, circuits and systems</td>
<td></td>
</tr>
<tr>
<td>Homework:</td>
<td>25%</td>
</tr>
<tr>
<td>Final:</td>
<td>25%</td>
</tr>
</tbody>
</table>
some suggestions

1) Do the reading **before** class (and after)


3) **Attend relevant departmental / Discovery Park seminars**

4) **Monitor the course homepage for announcements, handouts, etc.**
   (http://cobweb.ecn.purdue.edu/~ee612)

5) **Use www.nanoHUB.org as a course supplement**
Good luck in EE-612!

feel free to contact me at lundstro@purdue.edu