ECE 585 MOS Device Modeling & Design

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Instructors:

Elyse Rosenbaum

Prerequisites:

Although ECE 441 (Physics of Semiconductor devices) is recommended as a course pre-requisite, it's not mandatory. One can do well and learn from this course without it.

When to Take It:

This course is usually offered two years once and in the spring semester. It's tailored for students interested in understanding device mechanics of MOSFETs and its generations. Better appreciated after taking circuit classes such as ECE 482 & 483. Materials and Processing background also helps. Second year of graduate school is the ideal time to take this course. The course follows the book the Yuan Taur & Tak H Ning: Fundamentals of Modern VLSI Devices; Second Edition.

Class Content:

Content ---

(1) MOS capacitors and C-V curves
(2) DC Drain current Modeling of MOSFETs.
(3) Scaling and Short Channel Effects
(4) Transient Models
(5) Advanced techniques such as strained silicon and pocket implants.
(6) PD-SOI, FD-SOI (Silicon on Insulator) and FinFETs.

Work:

The course consists of

- 10 Home Works - Depends on the material covered in class. One or two HWs turns out to be very long. On an average you will spend around 2 hrs per HW. (25%)
- One Midterm - Prof. Rosenbaum is known for her hard exams. Grading is curved. Getting an average score shouldn't be too hard. (25%)
- Project - Literature survey of a topic (usually done individually) or TCAD can be used in projects (done in groups of two) for simulation of device behavior.
  
  A presentation is judged by your classmates (30%) and a report is to be submitted (70%). Overall the course project is worth 30%.
- Final exam - Topics which are covered after midterm is worth 20%.

Life After:

This class prepares you for a career in devices and modeling. Circuit Designers may find this helpful, when designing in advanced nodes and it gives a feel for the models used and how reliable they can be. Engineers having materials background may take this course to get an idea of the processing techniques used. MOS evolution can be thoroughly understood.