

Senior Project Idea for 2007-08

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Title: Simulation Study Comparing the Performance of Silicon Nanowire MOSFETs with Carbon Nanotube FETs.

Description:

Silicon nanowire MOSFETs and carbon nanotube FETs are both transistors that are being investigated and their fabrication processes developed as a possible replacement for the conventional, planar silicon MOSFET used in CMOS. This project will entail modeling these two new types of devices using existing, state-of-the-art software available on Purdue's NanoHUB website and comparing their performances. The aim is to investigate each of their relative performance advantages and disadvantages. No development of the software is needed; the working software is available on the NanoHUB without cost (financial support is provided by the National Science Foundation).

Background Needed:

No special, previous background is needed in device modeling, only an interest in learning more about these devices. Your background from 481,2 Solid State Electronics I & II and 351,352 Electronics I & II will be useful.

Proposed Work:

There are several existing modeling tools available on the website to simulate silicon nanowire FETs, such as NanoWire, nanoFET Lab and nano-CMOS, and to simulate carbon nanotube FETs, such as CNTFET Lab and Schottky-Barrier CNFET. The initial task will be to investigate these tools to decide which one is most useful to use for both the silicon and carbon nanotube FET modeling. Subsequently, a series of simulations will be needed for identically sized silicon and carbon nanotube FETs for use in the comparison. Also available on the website is a software tool PETE: Purdue Emerging Technology Evaluator which allows one to simulate the operation of new transistors in simple benchmark circuits such as an inverter and a ring oscillator. The results of the modeling of the silicon nanowire and carbon nanotube FET described above could be used as input in this software for comparison of the circuit performance of the two technologies. If you are interested in discussing the project, please contact me (kroenker@ececs.uc.edu) and we can meet. This project would be suitable for a team of two.

NanoHUB website: <http://www.nanohub.org/>