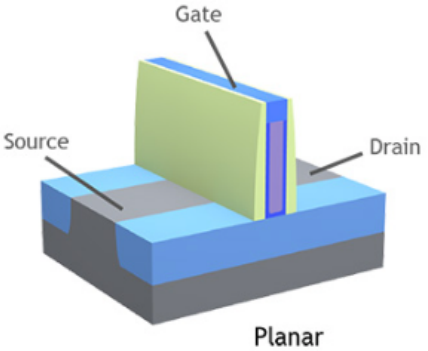
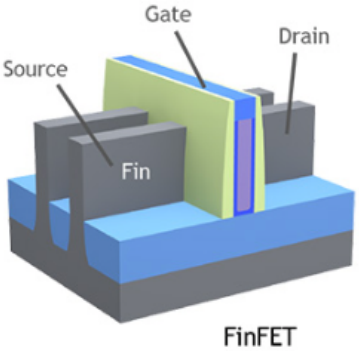
Fall 2018: ECE 557
Principles of CMOS Devices and the Road Beyond!

Moore's law continues to demand high performance and low power consumption from transistors in order to meet the requirements of the emerging applications such as high-performance computing, big data analytics, internet of things, health technologies, autonomous driving, security and more.

After a break of a few years, ECE 557 is back in a revised and updated form to provide students an in-depth knowledge of CMOS device physics, scaling principles and new devices beyond CMOS such as FINFETs, Tunnel FETs, FerroFETs and more. The students will also work on a device-modeling project to design specifications at the sub 10-nm technology node.



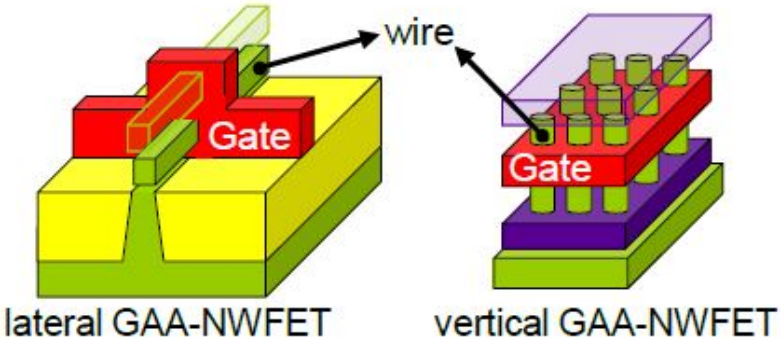
Planar



FinFET

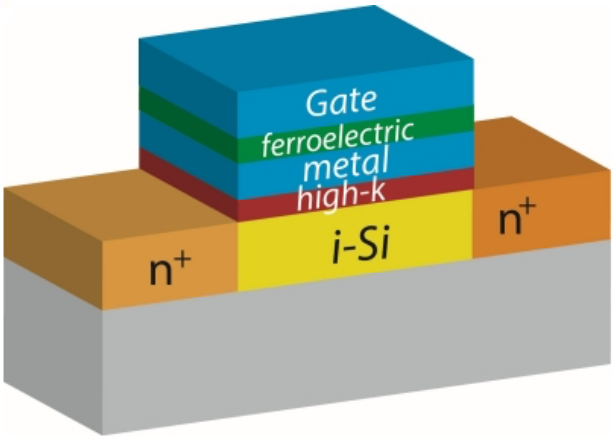
Instructor:
Dr. Veena Misra
Distinguished Prof. ECE
vmisra@ncsu.edu

Lectures: Mon-Wed 10:15am -11:30am, Room 1227 EBII
Prerequisites: ECE 302/404 or equivalent.



lateral GAA-NWFET vertical GAA-NWFET

Topics Covered:
1. Review of fundamental semiconductor concepts and equations
2. MOS Capacitor: quantitative charge analysis, dielectric properties, charge traps etc.
3. MOS Gate Diode : Quantitative analysis, applications.
4. MOSFET Characteristics: IV analysis, V_T calculations, ion implanted channels
5. Scaling Laws
6. Recent Advances in MOSFET Scaling
7. MOSFET Reliability
8. FINFETs: lateral, vertical, gate all-around
9. Beyond CMOS Devices: Tunnel FETs, FerroFETs
10. Applications: Low power, high- power RF
11. Ultimate Limitations of Computation



Grading
2 Exams 20% each
Optional Final Exam 20%
Homework 10%
Group Project 30% based on modeling