

HW2 – Due: September 22nd at 11:59 pm

(Late HW will not be accepted)

Using MATLAB or Excel, develop a simulation tool that would ask a user the type of the semiconductor (p or n type), doping density, and surface potential in a silicon based MOS capacitor and then plot the energy diagram only in the semiconductor.

So the simulation inputs are: 1- choice of type: p or n, 2- $N=?$, 3- $\psi_s=?$

Output: A figure (plot) with y-axis being Energy (eV), x-axis distance (μm) with $x=0$ being the surface of the semiconductor. The plot should have 4 curves for E_c , E_v , E_f and E_i .

Note: You are not expected to write a code to solve Poisson's equation, but you can write the code to plot the analytical solution of the Poisson's equation (ax^2+bx+c with a , b , and c being functions of doping density, ψ_s and considering the type of semiconductor).

Submission and grading rules:

- If you use MATLAB, submit a bug free .m file
- If you use Excel, submit the Excel file
- Grading process will be done by me testing the codes for arbitrary values of N , ψ_s and choosing the semiconductor type.
- When I test the code I verify the correctness of the software by verifying the energy difference between the E_i and E_f in the bulk and at the surface, and the numerical value of x_p (or x_n) presenting the depth of depletion region.