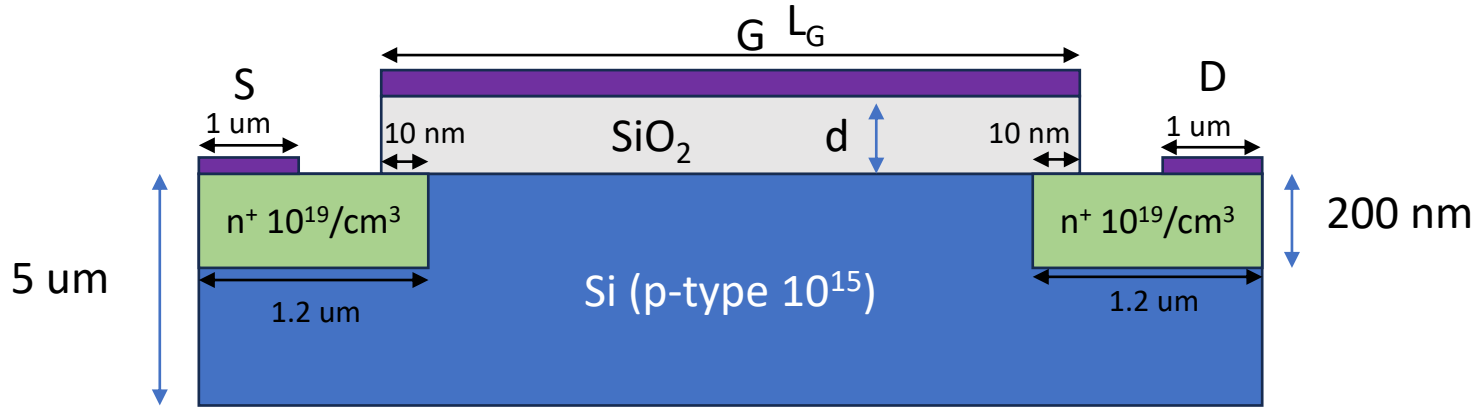
Assignment 4

ECE 445

Submission deadline: 12th Dec,2023

MOSFET

100 points



When you vary one parameter, keep the default values for the others.

1. Plot the Drain current (I_D) vs Gate voltage (V_G) for L_G=2 um, 1 um (default) and 0.5 um, keep V_D=10 V. Plot the transconductance (g_m) vs gate voltage for the above-mentioned L_G.
2. Plot I_D vs V_G for SiO_2 thickness (d) of 10 nm and 20 nm (default). Plot the threshold voltage change with oxide thickness, explain the reason behind it.
3. If we would replace SiO_2 with HfO_2 and want to keep the threshold voltage same as SiO_2 with 10 nm thickness, what is the HfO_2 thickness we can use? You can only make a calculation instead of simulations.
4. Plot I_D vs V_G under substrate doping concentrations: 1E15 (default) and 1E16. Explain the threshold voltage change.
5. Plot I_D vs V_D (0-5 V with a step of 0.2 V) graph for different V_G (0-5 V, with step of 1 V).