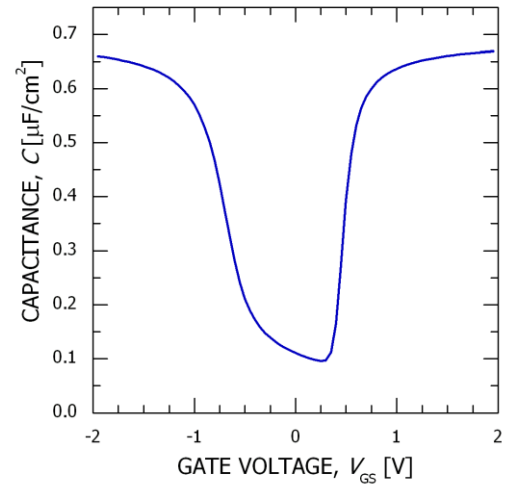


Homework 08

Q1.

The C - V characteristic of a single-gated silicon MOS structure is shown on the right.

- (i) What type substrate (p -type or n -type) and gate material (metal or polysilicon) have been used in the structure?
- (ii) Extract (calculate) the gate-oxide thickness, T_{OX} , and the threshold voltage, V_{TH} .
- (iii) If it is a non-ideal structure, calculate Φ_{MS} .
- (iv) How will changing the substrate doping density affect the C - V characteristic?
- (v) What happens if the substrate is made of strained-silicon rather than silicon?



Q2. Design a single-gate Silicon MOS structure that will be used in a MOSFET with a channel length of 50 nm. The threshold voltage of the MOSFET should be 0.25 V. The design parameters that need to be considered (determined) are as follow: gate oxide thickness and substrate doping density. Use reasonable values for physical quantities and assume a nickel-based gate contact and room-temperature operation. Also, assume a -0.5V shift in the threshold voltage due to the charge-sharing effect as observed in a short channel device.