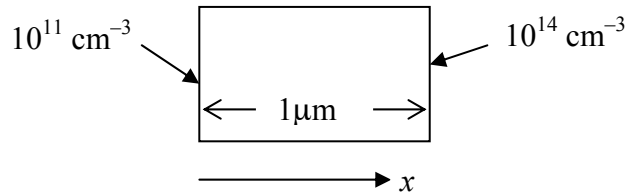
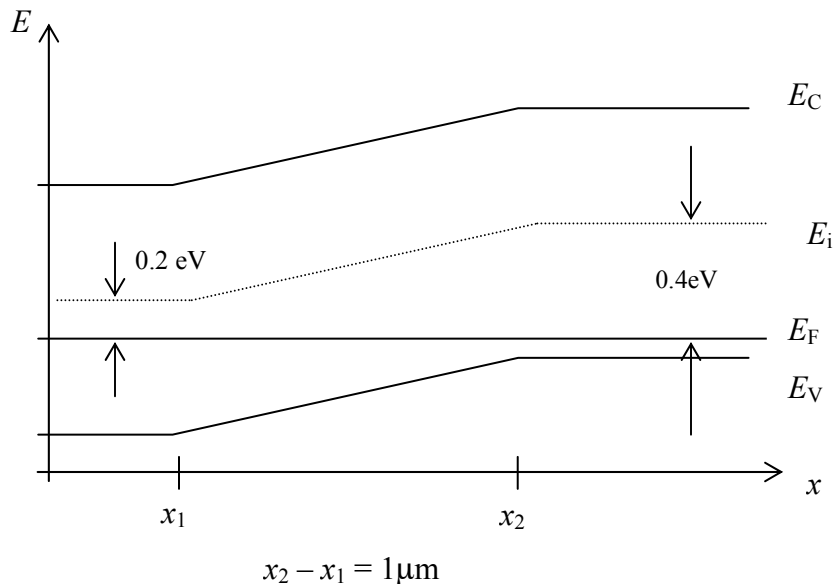


ECSE-2210 Microelectronics Technology
Class Activity 7

- 1) A silicon piece of $1\ \mu\text{m}$ thick is shown below. By some magic, we maintain an electron concentration linearly varying from $10^{11}\ \text{cm}^{-3}$ to $10^{14}\ \text{cm}^{-3}$ inside the sample. Calculate the electron diffusion current density $J_{N|\text{diff}}$ in A/cm^2 and its direction. Repeat if carriers were holes. Assume $D_n = 25\ \text{cm}^2/\text{s}$ and $D_p = 10\ \text{cm}^2/\text{s}$.



- 2) A silicon sample maintained in equilibrium at 300 K is characterized by the energy band diagram in the figure. Answer the questions below. Also write down (on the side) the general equations that you used to get the answer.



- (a) Sketch the electric field \mathcal{E} inside the semiconductor as a function of x . Find the numerical value for the \mathcal{E} -field in units of V/cm.



- (b) Sketch the potential inside as a function of x . What is the potential difference between the two ends?



- (c) Roughly sketch p versus x . Find p at the two ends and plot qualitatively in between.



- (d) Make a rough sketch (qualitatively) of the hole drift-current density ($J_{p|drift}$) as a function of x . (Assume $\mu_p = 400 \text{ cm}^2/(\text{Vs})$ if you want to calculate numerical answer).



- (e) What will be the hole diffusion current density ($J_{p|diff}$) based on the result of question (d)?