# Lecture 18

# Semiconducting Devices

- Electronic
  - Logic
    - Diodes
    - Transistors
      - FET
      - BJT
  - Power
- Opto Electronics
  - Solar
- Magnetic
- Thermal

## Diodes:

- PN Junctions


- Schottky diodes

p-type

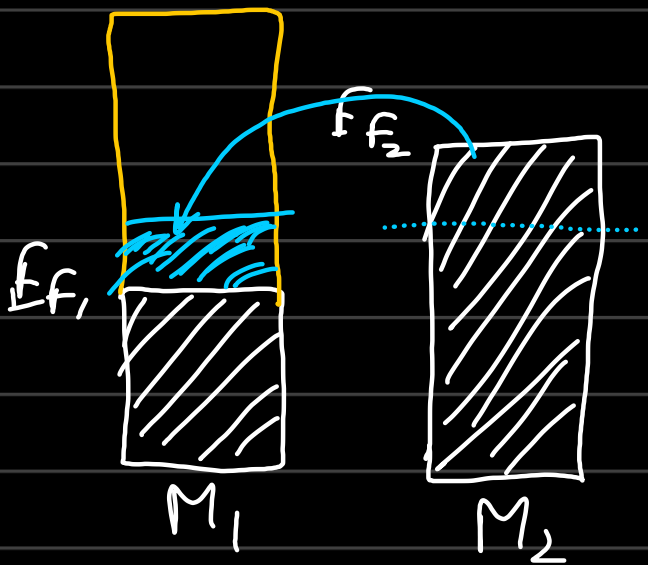
n-type

$$J = -D\frac{dC}{dx}$$ {Fick Law of Diffusion}

→ Definition of Equilibrium: there is no net movement of charges. {$J=0$}

→ Definition of Steady State: constant wrt time

$$\left\{\frac{dJ}{dt}=0\right\}$$



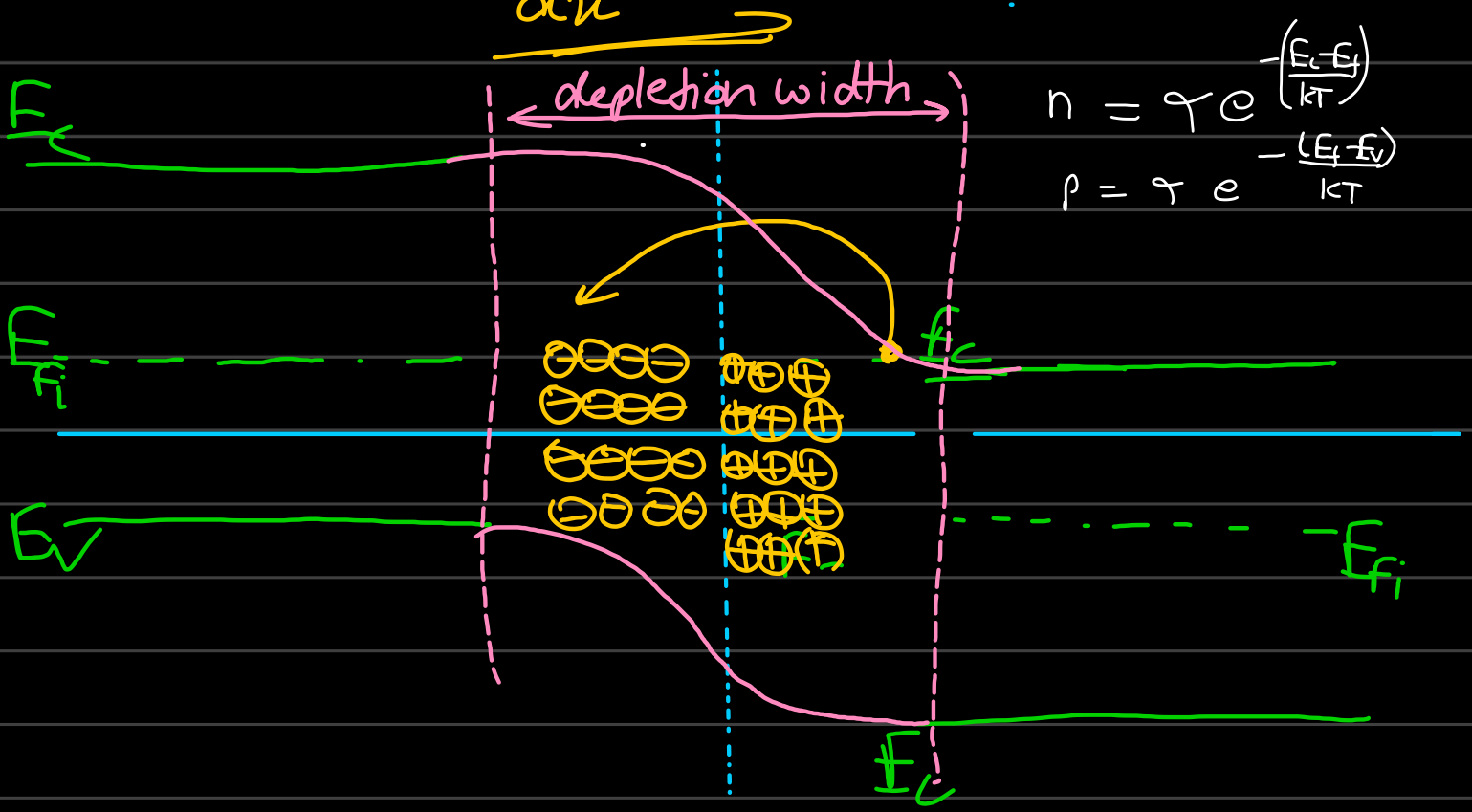

$\Delta E_f \neq 0$

↳ $J \neq 0$

$\Delta E_f = 0 \rightarrow J = 0$

# PN Junction at Equilibrium

↳ $J = 0 \Rightarrow \frac{dE_f}{dx} = 0$




$$n = \gamma e^{-\left(\frac{E_c - E_f}{kT}\right)}$$

$$p = \gamma e^{-\frac{(E_f - E_v)}{kT}}$$