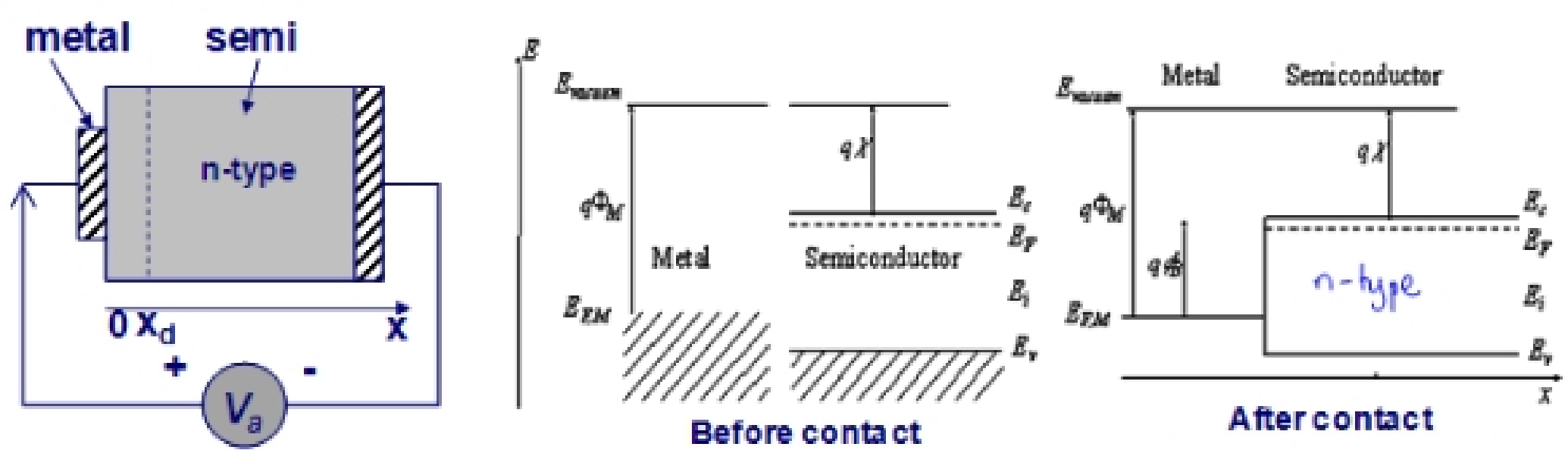




EE 442 in a Lecture and a Half

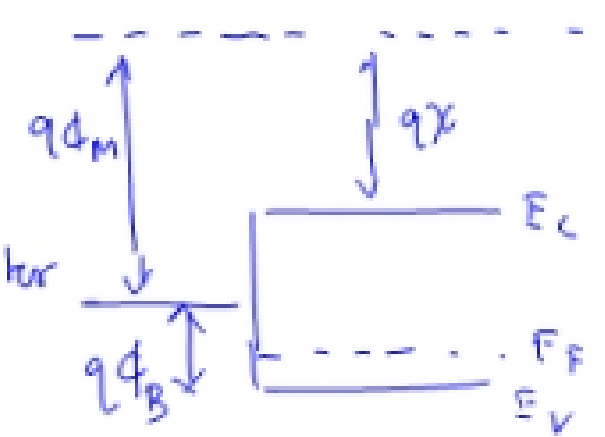


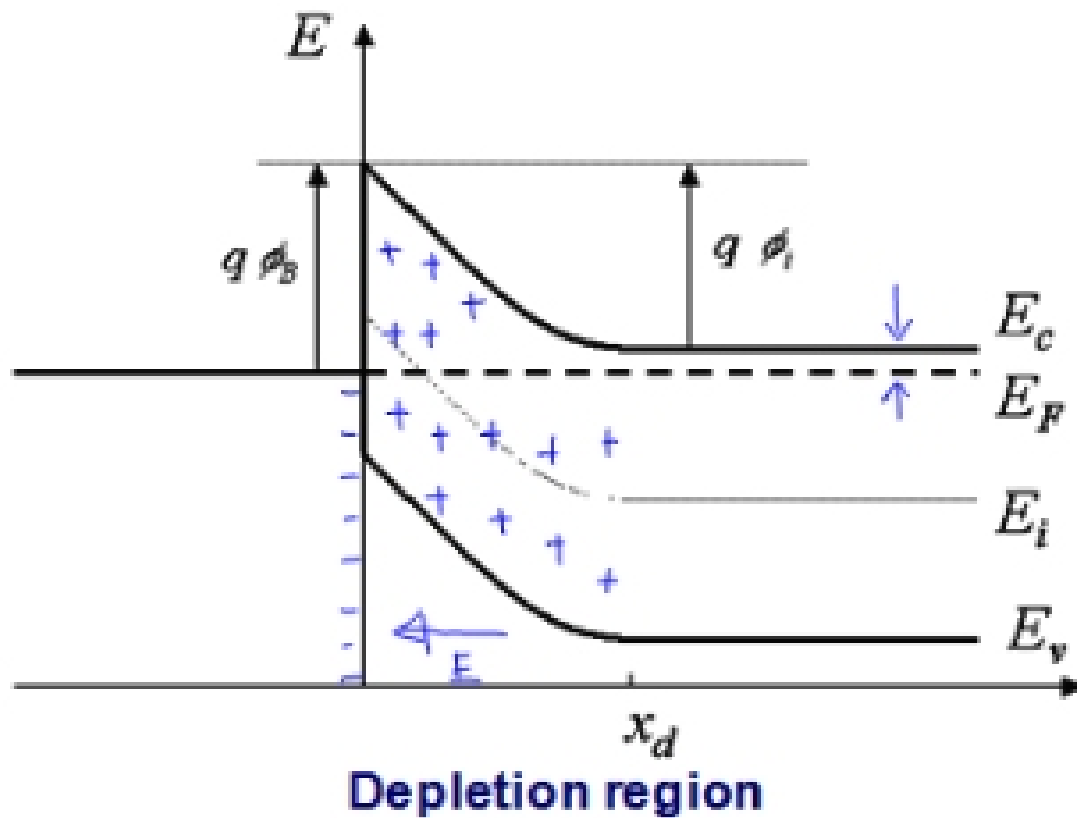
• Important parameters for an M-S junction:

- Barrier height ϕ_B
- Built-in potential ϕ_i

$\phi_B = \phi_m - \chi$, for an n-type Semiconductor

$\phi_B = \frac{E_g}{q} + \chi - \phi_m$, for a p-type Semiconductor

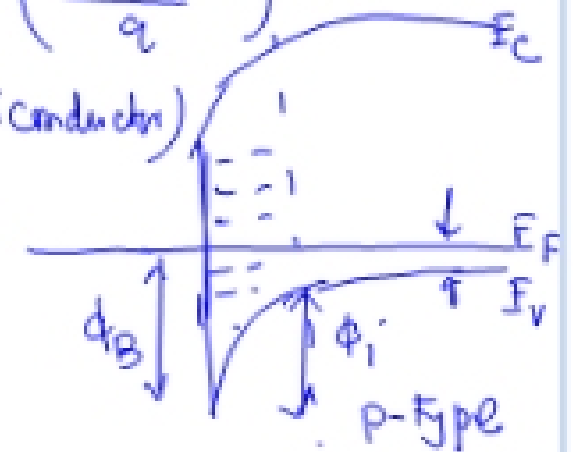




Built-in Potential

$$\begin{aligned} \phi_i &= \phi_B - \frac{(E_c - E_F)}{q} \\ &= \phi_m - \chi - \frac{(E_c - E_F)}{q} \quad (\text{n-type Semiconductor}) \end{aligned}$$

$$\begin{aligned} \phi_i &= \phi_B - \frac{(E_F - E_v)}{q} \\ &= \chi - \phi_m + \frac{(E_c - E_F)}{q} \quad (\text{p-type Semiconductor}) \end{aligned}$$



- **Electrons from n-type semi traverse across the junction to lower their energy leaving behind +ve ionized charge**
- **At thermal equilibrium, the diffusion of electrons is balanced by the drift of electrons in the opposing field set by the +ve ionized donors**