

# Lecture 15:

# Small Signal Modeling

Prof. Niknejad



# Lecture Outline

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- Review: Diffusion Revisited
- BJT Small-Signal Model
- Circuits!!!
- Small Signal Modeling
- Example: Simple MOS Amplifier

# Notation Review

$$i_C = f(v_{BE}, v_{CE})$$

Large signal

$$I_C + Di_C = f(V_{BE} + DV_{BE}, V_{CE} + DV_{CE})$$

Quiescent Point  
(bias)

small signal

DC (bias)

$$I_C + i_c = f(V_{BE} + v_{be}, V_{CE} + v_{ce})$$

small signal  
(less messy!)

$$Q = (V_{BE}, V_{CE}) \rightarrow i_c \left. \begin{array}{c} \text{?} \\ \text{?} \\ \text{?} \end{array} \right|_{BE} \Big|_Q + \left. \begin{array}{c} \text{?} \\ \text{?} \end{array} \right|_{CE} \Big|_Q v_{be} + v_{ce}$$

transconductance

Output conductance

- Since we're introducing a new (confusing) subject, let's adopt some consistent notation
- Please point out any mistakes (that I *will* surely make!)
- Once you get a feel for small-signal analysis, we can drop the notation and things will be clear by context (yeah right! ... good excuse)