Lecture 21

Frequency Response of Amplifiers (I)

Common-Emitter Amplifier

Outline

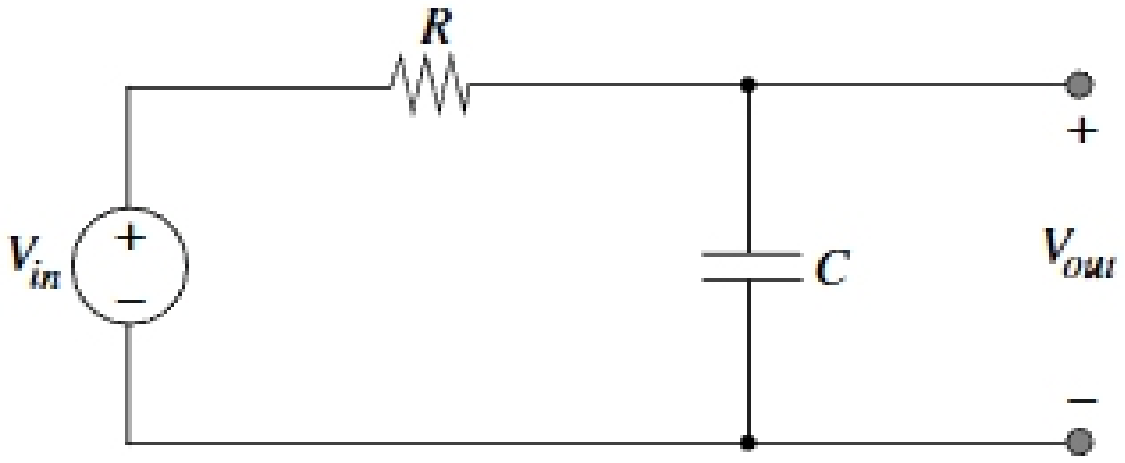
- Review frequency domain analysis
- BJT and MOSFET models for frequency response
- Frequency Response of Intrinsic Common-Emitter Amplifier
- Effect of transistor parameters on f_T

Reading Assignment:
Howe and Sodini, Chapter 10, Sections 10.1-10.4

I. Frequency Response Review

Phasor Analysis of the Low-Pass Filter

- Example:



- Replacing the capacitor by its impedance, 1 / (jωC), we can solve for the ratio of the phasors V_{out}/V_{in}

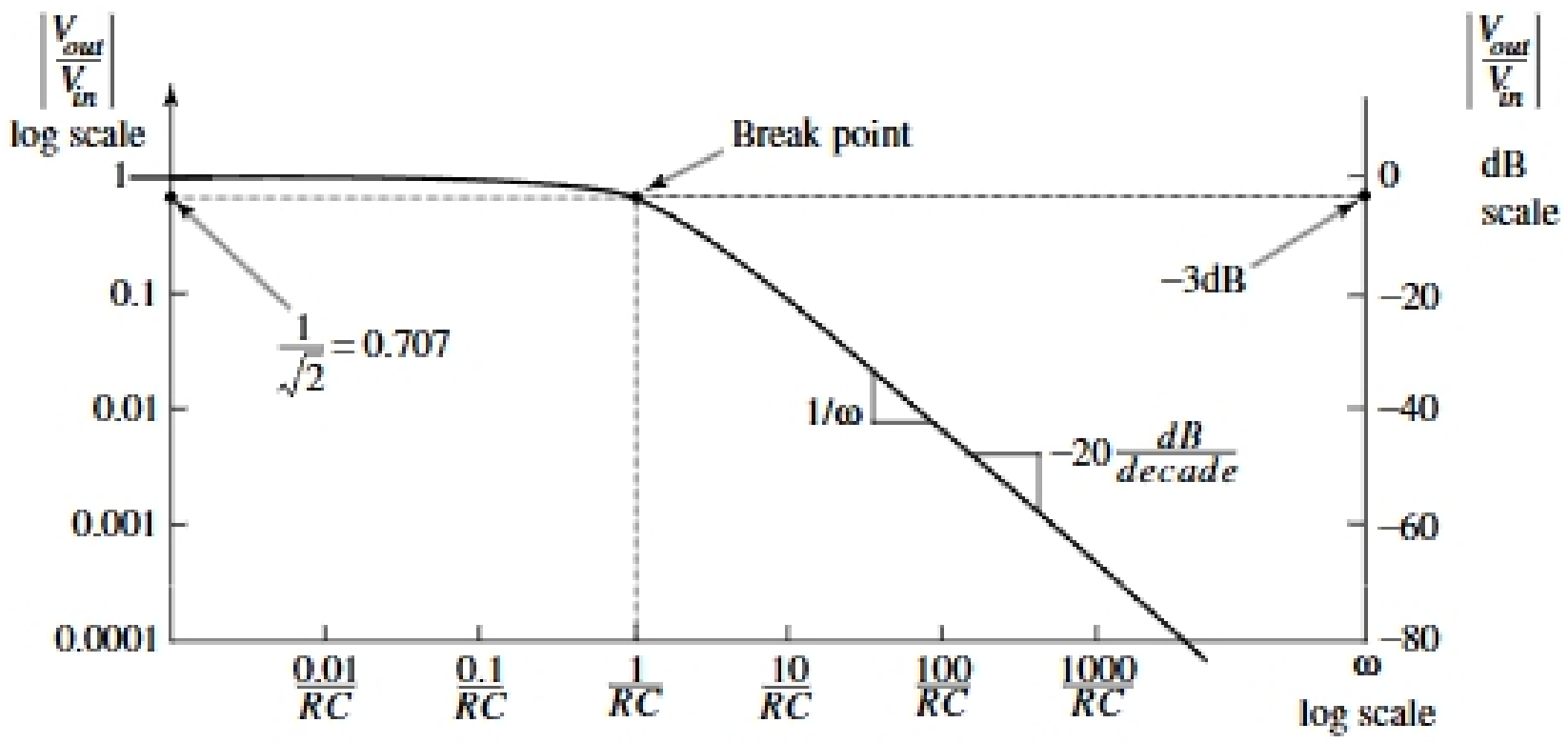
$$\frac{V_{out}}{V_{in}} = \frac{1/j\omega C}{R + 1/j\omega C}$$

$$\frac{V_{out}}{V_{in}} = \frac{1}{1 + j\omega RC}$$

- $V_{out} \equiv$ Phasor notation

Magnitude Plot of LPF

- $\left|V_{out} / V_{in}\right|$ --> 1 for "low" frequencies
- $\left|V_{out} / V_{in}\right|$ --> 0 for "high" frequencies



- The "break point" is when the frequency is equal to ω_o = 1 / RC
- The break frequency defines "low" and "high" frequencies.
- dB $\equiv$ 20 log x ----> 20dB = 10, 40dB = 100, -40dB = .01
- At ω_o the ratio of phasors has a magnitude of - 3 dB.