Lec 7

- Problem of Noise Coupling
- Differential Signals
- Differential Pair

Electrocardiogram System (ECG)
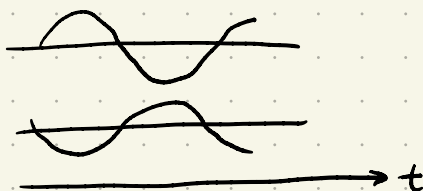
has 50Hz noise

$V_1 + V_n$

$V_2 + V_n$

Analog to Digital Conv

$V_1 - V_2$ has no 50Hz noise
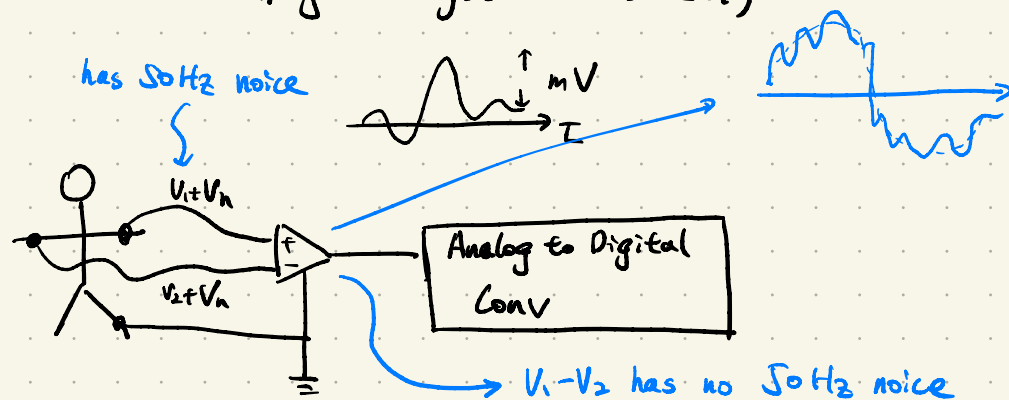
- Differential Signals:
  - (a) they vary by equal and opposite amounts
  - (b) they have the same DC value

V_1

V_2

V_{cm}: the common mode level
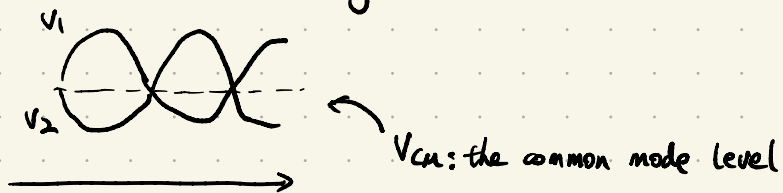
Not differential
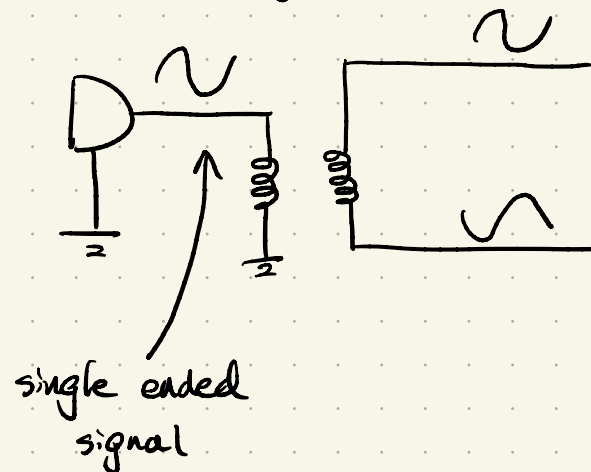

$$V_1(t) = V_0 \sin \omega t + V_{cm}$$
$$V_2(t) = -V_0 \sin \omega t + V_{cm}$$

Example

Determine the peak and V_{pp} of $V_1(t)$, $V_2(t)$, $V_1 - V_2$

	V_1	V_2	$V_1 - V_2$
Peak Amplitude	V_0	V_0	$2V_0$
V_{pp}	$2V_0$	$2V_0$	$4V_0$

How do we generate differential signals?

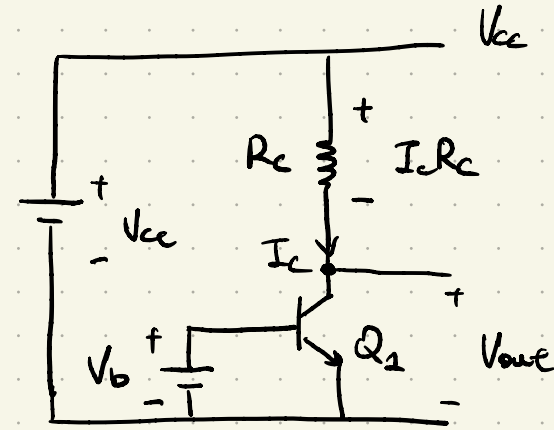single ended signal

The Differential Pair
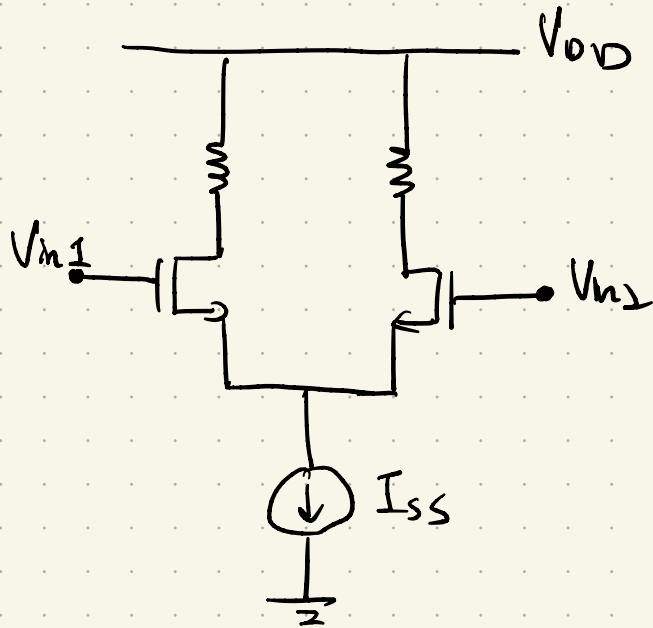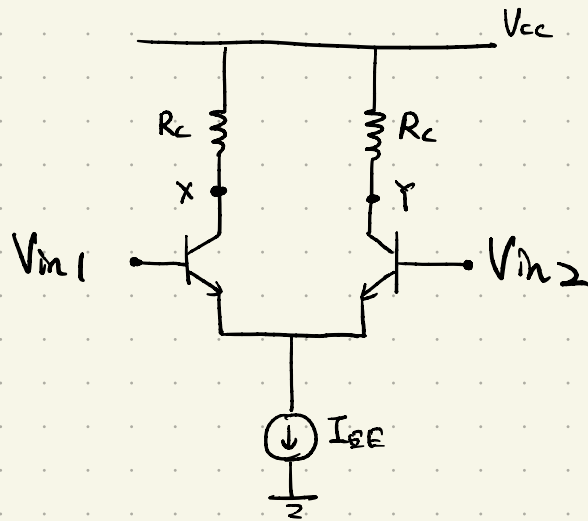
Review of CE Stage

$$I_c = I_s \exp \frac{V_b}{V_T}$$

$$V_{cc} = I_c R_c + V_{out}$$

$$\boxed{V_{out} = V_{cc} - I_c R_c}$$