Class # 12

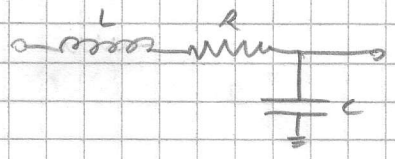
Radio Frequency (RF) Electronics

High Frequency → Domain where :
- interelectrode capacitance
- wiring inductance
- stored charge
- short wavelength

are important

low pass → $F_{3dB} = \frac{1}{2\pi RC}$

$Z_C = \frac{1}{j\omega C}$ $Z_L = j\omega L$



All connections have some L, R, & C. At high freq. this starts to matter.

Wavelength :

$c = \lambda \nu$ ← radiation in vacuum

$\lambda = \frac{c}{\nu}$ $c = 3 \times 10^8 \ m/s$

∴ For $\nu = 10\ kHz$, $\lambda = 30\ km$

For $\nu = 1\ MHz$, $\lambda = 300\ m$ ← (AM radio)

For $\nu = 100\ MHz$, $\lambda = 3\ m$ ← (FM, TV)

For $\nu = 1\ GHz$, $\lambda = 30\ cm$ ← (mobile phone)

For $\nu = 100\ GHz$, $\lambda = 3\ mm$

For circuits of characteristic size $\ell << \lambda$, we can think of the transmission of voltages & currents as instantaneous. We have been doing this implicitly in our circuit diagrams until now.