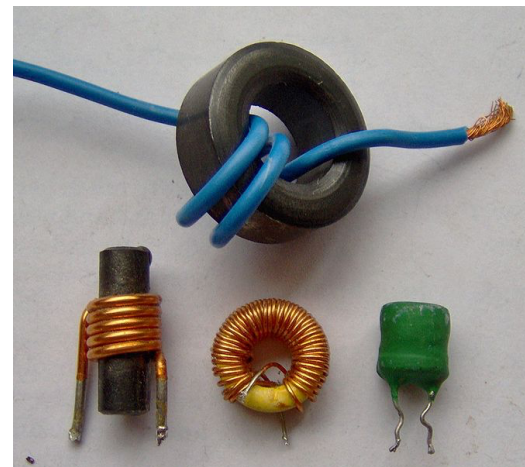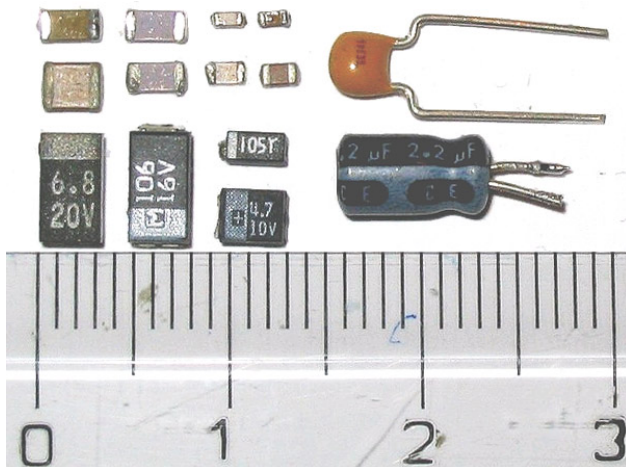# Capacitors and inductors

1. New circuit elements that are able to store energy

   Dynamic elements, i.e., they change with time

2. Allow to design circuits that perform integration and differentiation

   Make possible signal processing operations in modern communication and audio equipment

Capacitors

Defining relationship for the capacitor   ⊣⊢

$$q(t)=Cv_C(t)$$

C is capacitance, unit is farad (F), range 10^{-12} - 10^{-3}

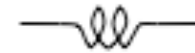i-v relationship

$$i_C(t) = dq/dt = Cdv_C/dt$$

If v_C is constant then $i_C=0$. Capacitor behaves as
open circuit under dc excitations

Power

$$p_C(t) = C/2 \; dv_C{}^2/dt$$

Inductors

Defining relationship for the inductor

$\lambda(t) = L i_L(t)$, $\lambda(t)$ is flux linkage

L is inductance, unit is henry (H), range 10^{-6} - 10^{-3}

i-v relationship

$v_L(t) = d\lambda/dt = L di_L/dt$

If i_L is constant then $v_L = 0$. Inductor behaves as short circuit under dc excitations

Power

$p_L(t) = L/2\ di_L^2/dt$