Capacitor and Inductor Cheat Sheet

**Capacitors:**

\[
Q = VC \\
\frac{dQ}{dt} = C \frac{dV}{dt} \\
I = C \frac{dv}{dt}
\]

Capacitors in series:
\[
\frac{1}{C_{eq}} = \frac{1}{C_1} + \cdots + \frac{1}{C_n}
\]

Capacitors in parallel:
\[
C_{eq} = C_1 + \cdots + C_n
\]

Electric Field Energy stored in a capacitor:
\[
E = \frac{1}{2} CV^2
\]

Voltage should never change instantaneously (because infinite current results)

In steady state, when connected to a DC circuit, they act as OPEN CIRCUITS.

Impedance: \[Z_C = \frac{1}{j\omega C}\]

**Inductors:**

We will never use the first two equations in this class, but they are here for your edification:

\[
\Phi = \frac{LI}{N} \\
\frac{d\Phi}{dt} = \frac{L}{N} \frac{dl}{dt} \\
V = L \frac{dl}{dt}
\]

Inductors in series:
\[
L_{eq} = L_1 + \cdots + L_n
\]

Inductors in parallel:
\[
\frac{1}{L_{eq}} = \frac{1}{L_1} + \cdots + \frac{1}{L_n}
\]

Magnetic Field Energy stored in an inductor:
\[
E = \frac{1}{2} LI^2
\]

Current should never change instantaneously (because infinite voltage results)

In steady state, when connected to a DC circuit, they act as SHORT CIRCUITS.

Impedance: \[Z_L = j\omega L\]

(Note that \[\frac{d\Phi}{dt} = \frac{V}{N}\] [Faraday’s Law], which is how we end up with \[V = L \frac{dl}{dt}\] from \[\frac{d\Phi}{dt} = \frac{L}{N} \frac{dl}{dt}\])