

# Lecture 34

- Instantaneous and average power

# Why care about power?

- Currents and voltages are the fundamental variables in linear circuits.
- However, in many practical cases we do not care about low level variables. All we care about is the power being generated and where it is going
  - Brightness of a lightbulb
  - Heat in an electric stove
  - Strength of transmitted/received signals
  - Electric grid distributes power to network nodes (houses, cities,...)
  - Etc.
- Power can be found from voltage and current, but not the other way around.
- It is often easier to study the power flows in a circuit, rather than the voltages and currents

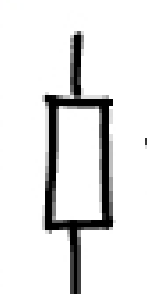
# Instantaneous power

- In general, the power being consumed at a given point in time is

$$P_{\text{inst}}(t) = v(t) * i(t)$$

where the voltage and current must follow the passive sign convention

- The above is always true, but it can change very fast

Example:  $v(t) = \sqrt{2} \cos(\omega t)$    $Z(\omega) = 1 + j$

Hence  $i(t) = \cos(\omega t - 45)$

