Lecture # 1, 9/29/21

Today

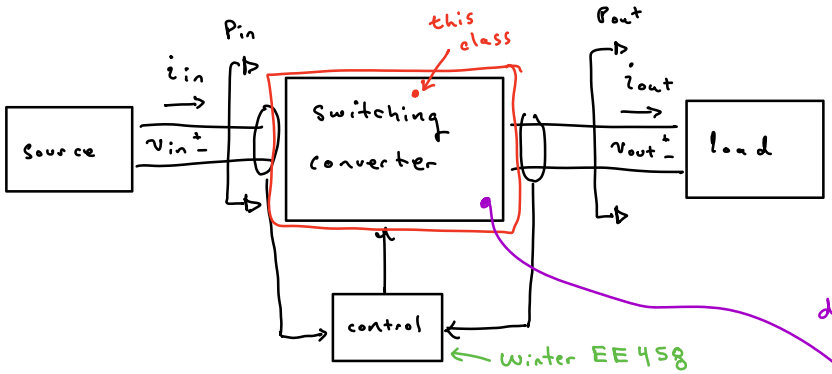
- Overview Slides
- Basics

Next Time

- Motor modeling → Facilitate Exp 1 of lab

— Power Electronics Overview (Ch 1 of book)

↳ Read this



dissipated as heat

Main Goals

- Minimize power loss

ideally $P_{in} = P_{out}$ ← never true

real world $P_{out} < P_{in} \Rightarrow P_{out} = P_{in} - P_{loss}$

* Define efficiency, eta

$$\eta := \frac{P_{out}}{P_{in}} < 1$$

} arguably most impt. metric

↑ higher is better

Rewrite as

$$P_{loss} = P_{in} - P_{out} = \underbrace{\frac{P_{out}}{\eta}}_{P_{in}} - P_{out} = P_{out}\left(\frac{1}{\eta} - 1\right)$$

- Other Metrics of Importance

  → weight / mass

  → cost

  → "specific power" = $\frac{\text{power}}{\text{volume}}$

  → volume

- Terminology

  - converter → any power electronics ckt
  - dc-dc converter → v_{in} & v_{out} are dc
  - dc-ac converters

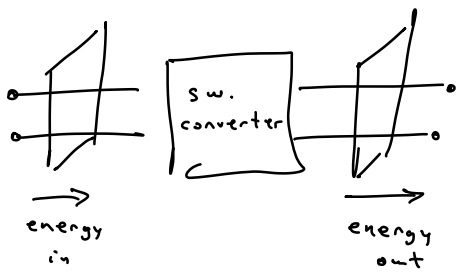
    AKA → inverter / drive v_{in} dc, v_{out} ac

    AKA → rectifier v_{in} ac, v_{out} dc

  - ac-ac converter

    "cyclo converter" → v_{in}, v_{out} both ac

- Energy & Power, physics recap



what's the diff between P & E ?

$$P = \frac{dE}{dt} = \text{rate at which energy flows}$$

$$E = \int_{t_{int}}^{t_{Final}} P\,dt$$