

Week 2: Electronics Review

Housekeeping

- Who's new?
- What you missed
 - Website
- Question from student, when is what appropriate
 - Breadboard
 - Perfboard
 - Shields and Breakouts
 - Custom PCB
 - * Through hole or SMT?
- Art of Electronics, High speed digital design
- Attempting to record this
- Who didn't get my email?
- Survey
- If you forgot your email ends in a 3. . . .
- Project Overview
 - Don't be afraid by it
 - Work in groups!
- Project Ideas
 - Clock (binary, laser, nixie tubes, etc)
 - Lab Power Supply
 - Automated coffee gear
 - Thermostat.
 - Sunrise alarm clock
 - Christmas lights
 - Logic Analyzer
 - Antenna Tuner
 - A useless box
 - Mood light

Going to go through this by components we will see

Circuits 1

- Resistors
- Ohms Law
- Combinations of resistors
 - This applies to impedance!
- My notations
 - Resistor values

- Blocks and chunks
- Batteries
- KVL
 - Watch out for crossing wires!
- KCL
 - Bonus: what law?
- Work backwards. LED resistor value.
- Thevenin/Norton - Just talk about it

LEAVE THIS DRAWING UP

Capacitors

- How is one made?
- What do they look like to DC?
- What happens when it's AC?
- $Z = \frac{1}{j\omega C}$
- $I_c = C \frac{dV}{dt}$
 - This is great, but a real pain in the butt. Nobody likes diffeq.

Circuits 2

- Ignore 99% of circuits 2
- We don't often care about the time domain
- Back to other circuit, add some complex stuff
- Positive is inductive, negative is capacitive. They can cancel!
- This isn't all, but it's all we care about.

Back to the pesky capacitor

- Parallel combinations
- Look at atmel datasheet
 - WHY
- Draw real capacitor

Electronics 1

All about devices

Diodes

- Piecewise approximation

- Zeners
- Bonus: Use one as a switch

BJTs

- Trash Can

FETs

- Largely seen as switches
- Generally talking about MOSFETs
- Voltage Controlled
- Piecewise approximation
- The good
 - Easy to make
 - Cheap
 - Low power
 - High Efficient
- The not-so-good
 - Draw a model
 - Capacitance
- Switching Power
- Thermal Transfer, Heatsinks
 - Datasheets

Wrap-up

- Brevity
- Purpose was making this followable
- Next week
 - EDA software
 - Options
 - Philosophies
 - KiCAD
 - Dev setups
- Questions?