EECS 16A

Module 2 Lecture 1.

Introduction to Circuit Analysis.

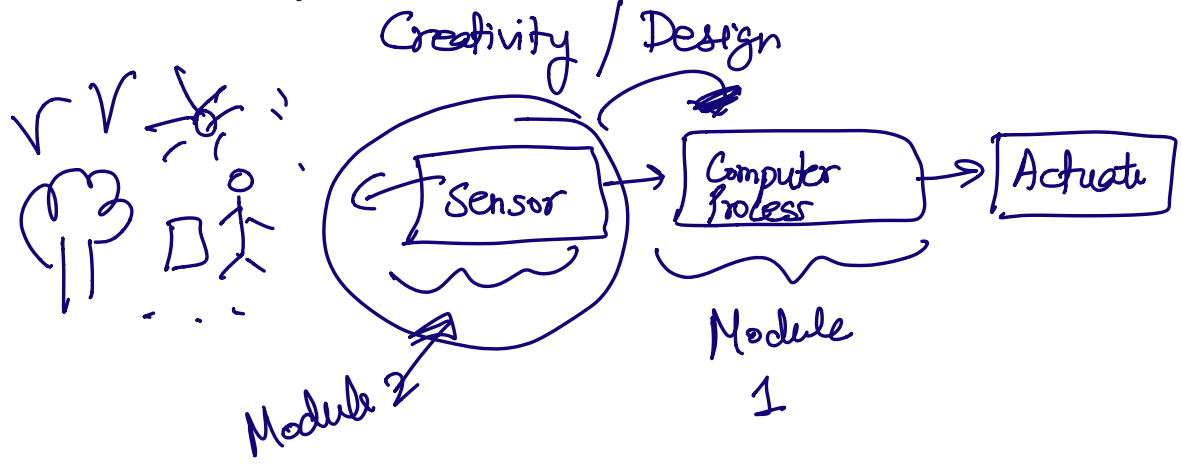
Logistics

1. Google docs test.
2. Office hours.
3. Review tonight.
4. HW 5 solutions released
5. Intro to research
   ↳ Tue after midterm.
   Oct 6th. 5-6 pm.

Module 1: How to model

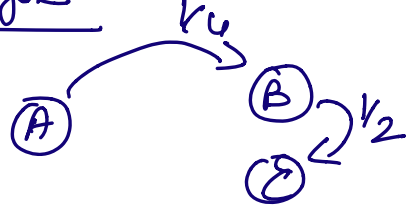
- Tomography.
- Page Rank
- Imaging.
- Traffic example.
- Communication
- Speech processing.
- Segways / Control / Robotics.

Module 2: Get into one model:



This module: Circuit Analysis

Notation / Conventions



Electrical Quantities

		Units	Symbol
①	Voltage "Across"	Volts (V)	V
②	Current	Amperes (A)	I
③	Resistance	Ohm (Ω)	R

Circuit Diagrams

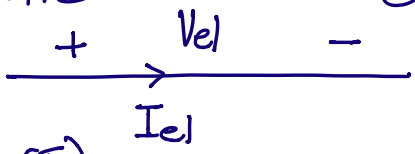
Equations : Linear

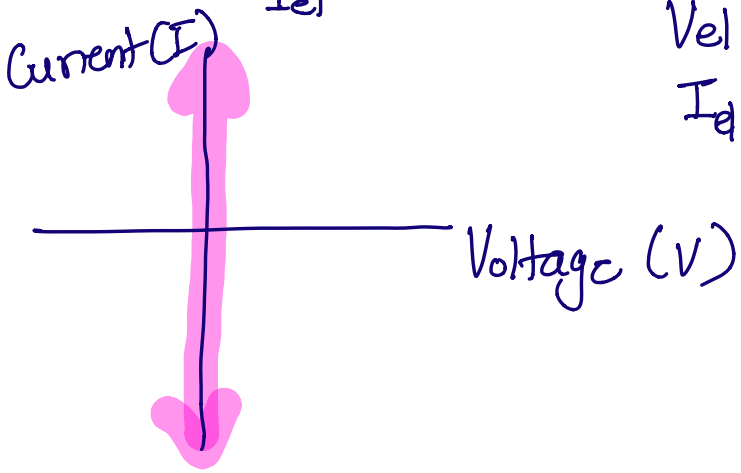
Circuit Elements

$V_{el} = V_{element}$

Voltage: across
Current: through

① Wire

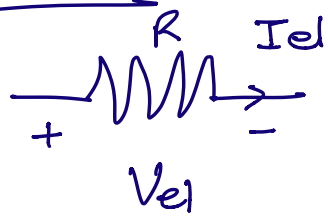


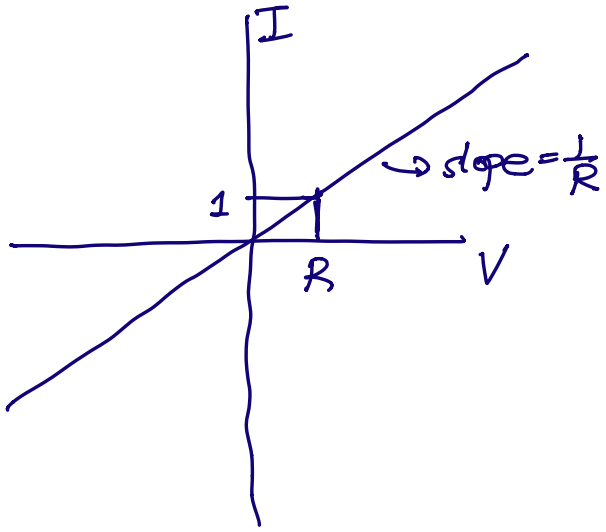


$V_{el} = 0$

I_{el} = arbitrary

② Resistor

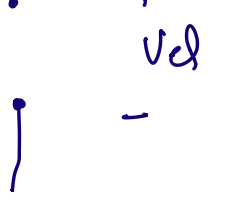


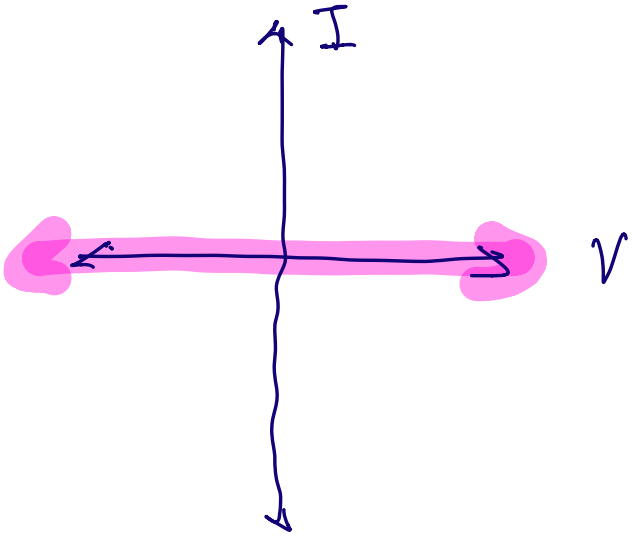


Ohm's Law

$$V_{el} = R \cdot I_{el}$$

③ Open Circuit

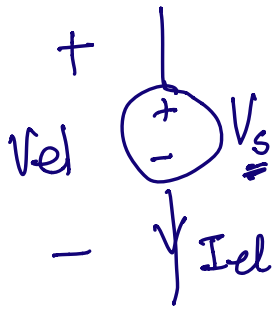


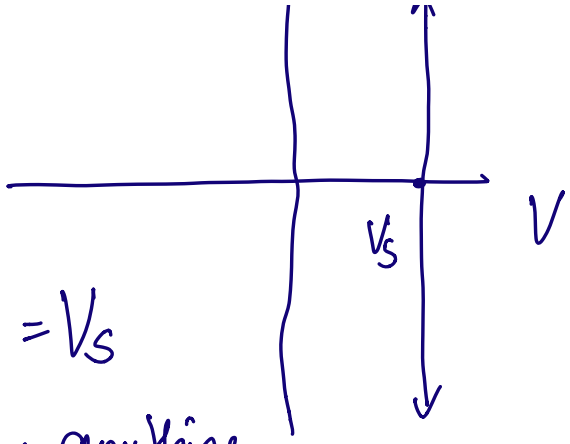


④ Voltage Source

voltage

Maintains a potential difference across its terminals

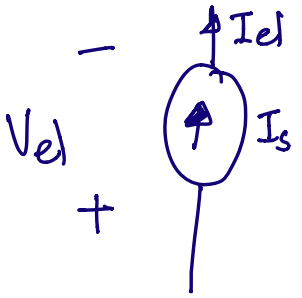


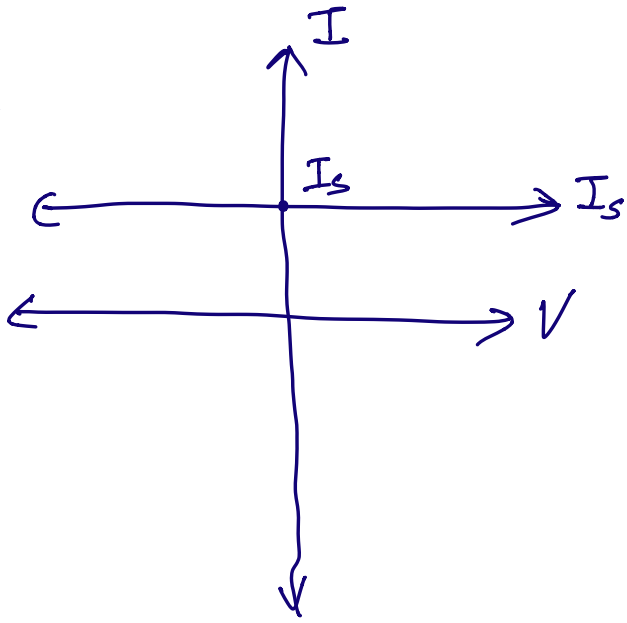


$V_{el} = V_s$

I_{el} = anything

⑤ Current Source





⑥ Ground Node

Mt Rainer: 4000 mts

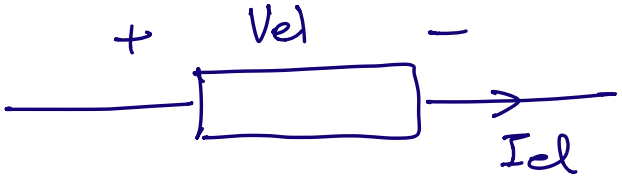
Goonnd

Define voltage as 0.

Measure voltage with respect to this point.

How to draw circuits

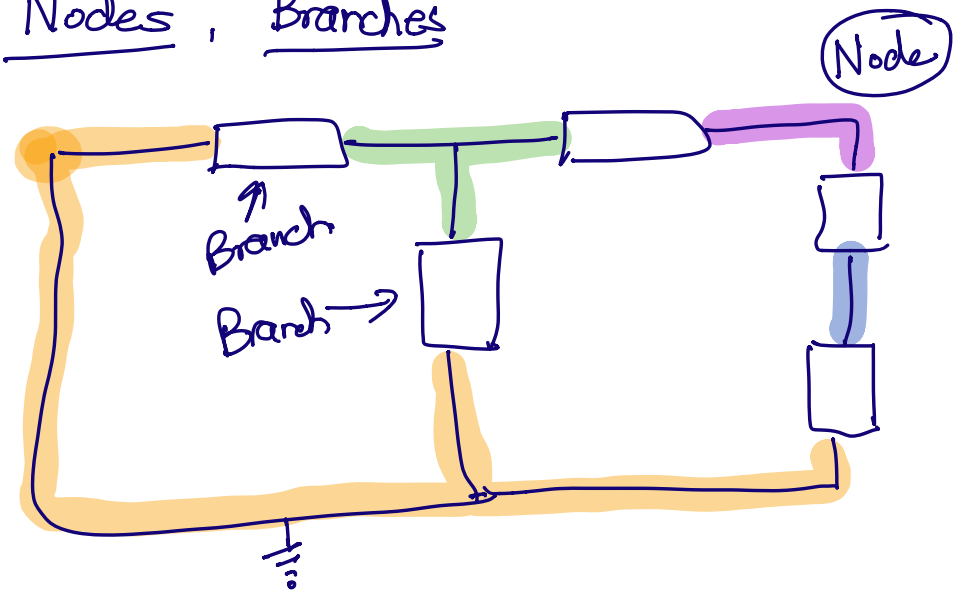
"Generic" circuit element



"Passive Sign Convention"

Current goes <u>in</u> to the + sign of the voltage and <u>out</u> of the negative sign.

Nodes, Branches

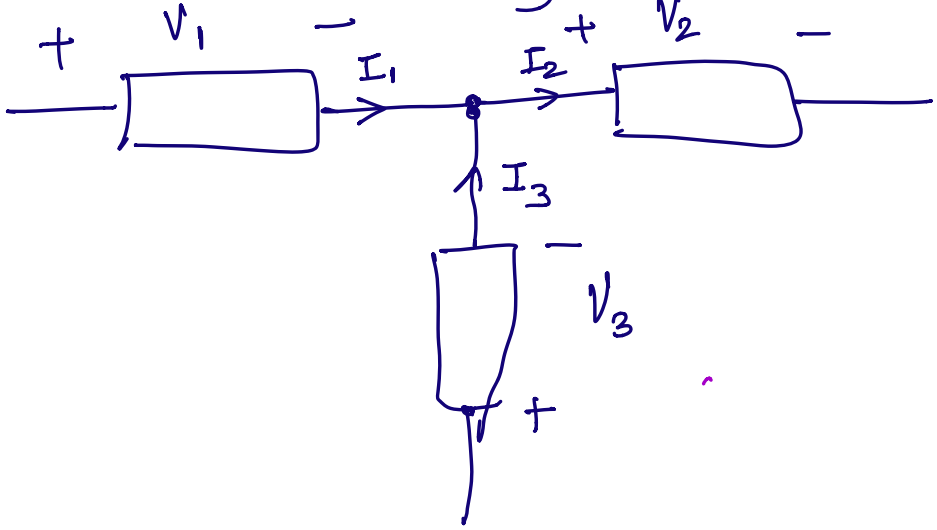


Branches: Connections between nodes.

- The unreasonable effectiveness of mathematics.

- Kirchhoff's Laws

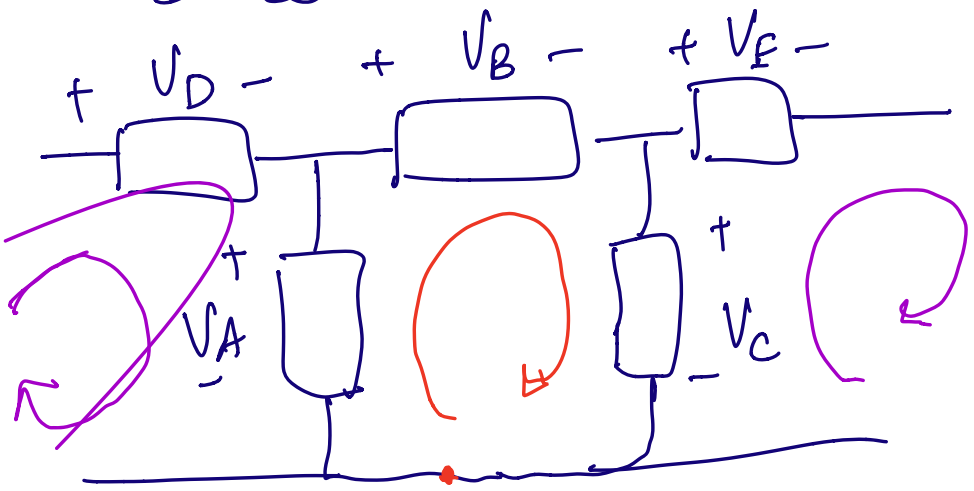
- KCL : The sum of all currents entering a node equals the sum of all currents exiting a node.



$$I_1 + I_3 = I_2$$

$$I_1 + I_3 - I_2 = 0$$

KVL : The sum of the voltages across the elements of a connected loop must be zero



$$-V_A + V_B + V_C = 0$$

6.021 Quantitative Physiology